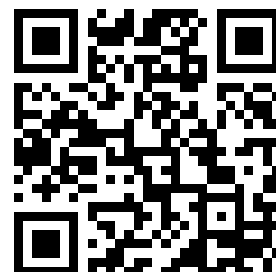




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VFG

HYDRAULIC TOOLS AND MACHINERY.

R. D. WOOD & CO.
PHILADELPHIA.

Foundries and Works :

Millville, }
Florence, } N. J.
Camden, }



WOOD BUILDING, 400 CHESTNUT STREET.

Engineers,

Iron Founders,

Machinists.

CONSTRUCTORS OF

Water and Gas Works Appliances.

CABLE ADDRESS :

"Tuckahoe," Philadelphia.

CODES.—A B C Code, 4th Edition,
Lieber's Code, 1896,
Premier Code,

A 1 Code,

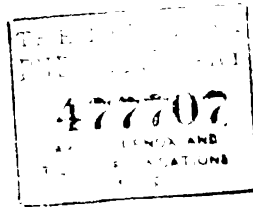
Watkin's Code,

Postal Directory Code,

Manufacturer's Export Code—Seeger's,
Western Union Telegraphic Code,
Anglo-American Telegraphic Code.

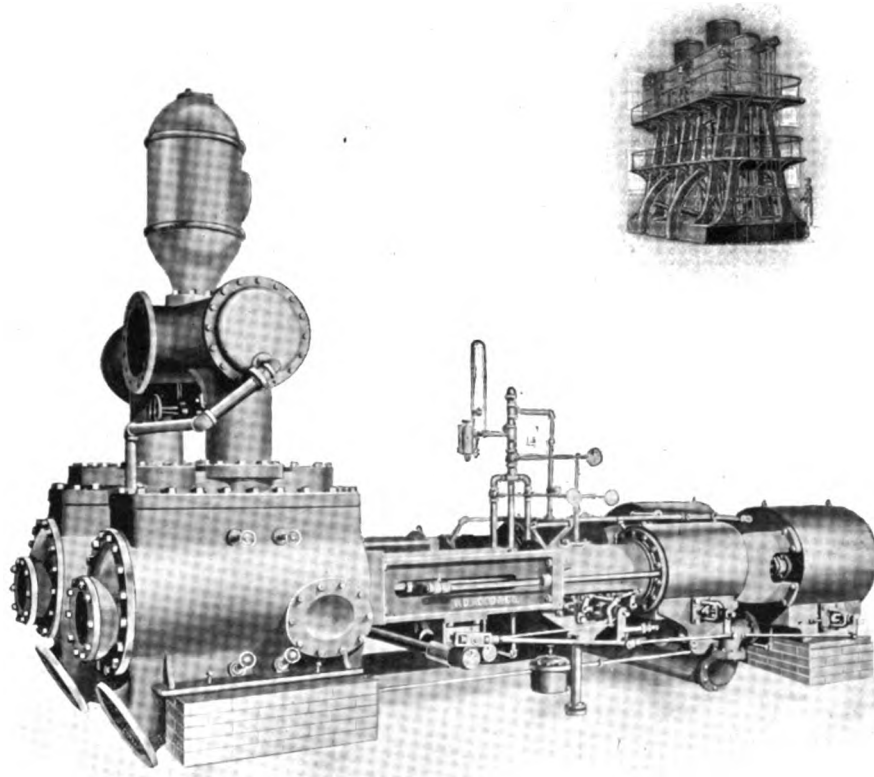
1902.

Established 1803.



ROY WOOD
JUNIOR
MADE

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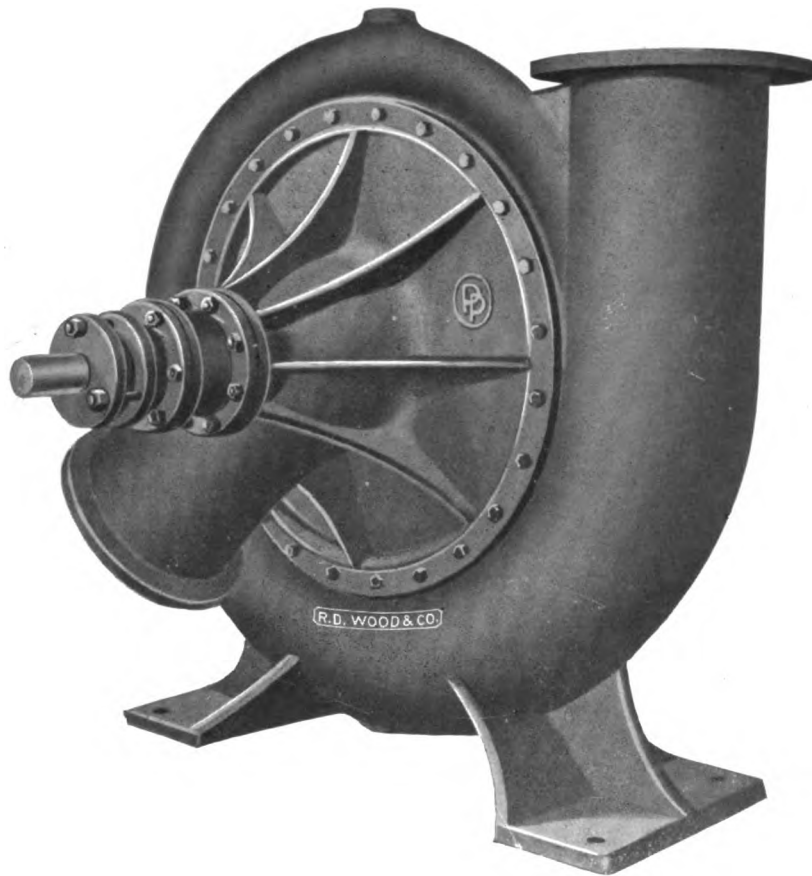
TRIPLE EXPANSION PUMPING ENGINES.

BOTH VERTICAL AND HORIZONTAL DESIGN.

HIGH duty pumping engines of both the crank and fly-wheel and direct-acting types for water works, irrigation and mine service. Designed to combine highest economic duty and efficiency with greatest reliability and utmost simplicity.

Estimates and drawings (either exact or preliminary) furnished upon application with statement of requirements to be fulfilled.

CENTRIFUGAL PUMPS.



DIRECT-CONNECTED OR BELT-DRIVEN.

Leading Specialties :

R. D. WOOD & CO.

PHILADELPHIA.

WORKS : MILLVILLE, FLORENCE AND CAMDEN, NEW JERSEY.

AMONG the leading specialties manufactured by R. D. WOOD & Co., Philadelphia, in addition to "Hydraulic Tools and Machinery," are the following :

Cast Iron Pipe—all kinds and sizes, 1" to 72".
Fire Hydrants—The "Mathews."
Valves for water, gas, etc.
Valve Indicator Posts, Patented.
Valves—Large Diameters, Geared and Power.
Valves—Foot and Check.
Sluice Gates, Intakes and Screens.
Tanks, Towers and Stand-Pipes.
Gas Holders and Gas Apparatus.
Gas Producers—"Taylor," Patented, and "Mond," Patented.
Gas Producer Plants for Operating Gas Engines.
Sugar House Work.
Castings for Chemical Works.
Turbines and Power Pumps.
High Duty Pumping Engines.
Centrifugal Pumps.
Heavy Special Machinery—to designs of purchasers.
Loam Castings.

See advertisements, pages 3, 4 and 92-103.



INTRODUCTION.

OUR original pamphlet descriptive of HYDRAULIC TOOLS AND MACHINERY—which was prepared especially for use in connection with our Exhibit at the World's Fair—was followed by enlarged editions in 1897 and 1901, our facilities having steadily increased, while we are constantly adding to our designs and patterns, in the development of this important and powerful class of machinery. In the following pages are illustrated some of the types of hydraulic tools and machinery built by us, including also cranes using some combination of hydraulic and electric or other powers. Attention is called to our lines of hydraulic valves, which merit careful consideration.

The CAMDEN IRON WORKS is equipped with modern tools, from a huge boring mill to the small lathes on which fine valve work is duplicated; and in our foundries we cast up to 50 tons weight. In general, our facilities are unequalled for the production of hydraulic and other machinery of the heaviest class; and in addition to our regular lines we make a specialty of heavy work to the designs of purchasers.

Our other lines of manufacture referred to in the advertising pages are covered by pamphlets entitled "Water and Gas Works Appliances," "The Taylor Gas Producer," "Centrifugal Pumps" and "High Duty Pumping Engines"—which will be sent on application.

R. D. WOOD & CO.

Philadelphia, June, 1902.

CABLE ADDRESS:

"Tuckahoe," Philadelphia.

CODES.—A B C Code, 4th Edition,
Lieber's Code, 1856,
Premier Code,
A 1 Code,
Watkin's Code,
Postal Directory Code,
Manufacturer's Export Code—Seeger's,
Western Union Telegraphic Code,
Anglo-American Telegraphic Code.

NOTES.

Standard Sizes.—The adoption of standard dimensions of tools as listed will insure minimum cost and quickest delivery.

Inquiries should be full and explicit as to all requirements, including dimensions, capacity and nature of service.

Inspection, Test and Guarantee.—All hydraulic machinery built by us is carefully inspected and tested as nearly as possible under working conditions; and guaranteed for one year against imperfect workmanship or material.

Complete Installations.—We install complete plants comprising pumps, accumulators, mains, etc., for operating hydraulic machinery, and will give estimates on receipt of details.

Expense of Installation.—The anticipated expense of installing a small hydraulic power plant to supply perhaps one or two tools has deterred some from considering it. However, this outlay has now been so much reduced that the necessary small pump, accumulator and piping can, in many cases, be installed for less than any other motive power; usually for less than a pneumatic power plant, and insuring much lower running cost.

FOREIGN SHIPMENTS.

Quotations, unless otherwise specified, cover delivery f. o. b. Philadelphia, New York or Baltimore, including boxing of the smaller parts.

Orders should be accompanied with Philadelphia or New York exchange for one-third of the price, and approved references; or bank advice providing for cash in Philadelphia or New York on presentation of shipping documents.

HYDRAULIC MACHINERY.

FOR the majority of operations to which hydraulic power can be applied, and especially those requiring very great force exerted through a comparatively short stroke, as in riveting, punching, shearing, lifting, forging and flanging, there is no other system at all comparable with it for efficiency, uniformity, simplicity or economy. This is true for several reasons; primarily in that there is absolutely no motion or power consumed except in the act and at the moment of performing the desired operation. At all other times everything is at rest. Secondly, the question of transmission from generator to machine is reduced to a small pipe carrying water, which, under proper conditions, is done with an efficiency far surpassing that of the line shaft, electric wire or air tube. This mode of applying power has all the flexibility of the two latter methods, with a capacity far beyond them for delivering quickly. This is one of the most important features of the hydraulic system, and its full realization is obtained by the use of accumulators of ample capacity. Under such conditions, it is the usual experience to have all the energy which a steam pump can deliver in the course of ten or fifteen minutes utilized in the hydraulic machine within a few seconds. *This is not possible in the use of any other form of machine tool.* In the item of wear alone, no other is so easy of maintenance, and requires so little attention, as the hydraulic form. When properly made, packings automatically adjust themselves until worn out, and friction is reduced to *the minimum*.

In a paper read recently before the Society of Civil Engineers in England, on the "Merits of Steam, Electricity and Water for Hoisting," the author strongly advocates hydraulic power, as it is quicker in action, more economical in operation, without running cost when not doing actual duty, noiseless, simple, clean, and with little wear and tear; and this author, we believe, voices the sentiments of those who have had the opportunity of making comparisons.

Hydraulic vs. Pneumatic Tools.—Comparison is often made between hydraulic and pneumatic tools, especially riveters. We realize that each has its place. There is, however, no comparison between the two when *heavy work* is to be done, or when absolute *uniformity* and *tightness* is to be secured. The hydraulic riveter's sustained squeeze, of definite and invariable power, produces always the same result, regardless of variation in the material used, steam pressure, etc.; whereas the power exerted by the pneumatic form usually varies with every alteration in the dimensions of the material, and the actual power exerted is always a matter of doubt. The pneumatic machines are usually more clumsy and slower of application to the work than the hydraulic when made of equal power; the only counterbalancing advantage being that, in case of leakage, there is no inconvenience to the workman. *Wherever applicable, hydraulic power is the most economical and efficient.*

Hydraulic vs. Geared Tools.—For such tools as punches, shears, bending and flanging presses, and in fact for any machine or crane in which, as previously stated, great force is exerted through a comparatively short stroke, hydraulic power has undoubted advantages. The force exerted to impel electrically- or steam-driven machines must be constantly in motion else there is no store of energy. With the hydraulic tool, however, there is no power exerted except when the tool is doing its work, as there is always a *store of energy to draw* upon instantly, without waiting for any machinery to get into motion. Then, too, in hydraulic tools there are the fewest number of working parts, with minimum movement and wear, as the designs are of the most simple character. There are no revolving shafts or gears to break when work too heavy for the tool is put into it, as in such cases hydraulic power will be exerted to the maximum only and stop without injury; whereas in the geared machine *something must give way*. Further, the motion of the hydraulic machine can be arrested instantly when a false start is made, thus preventing damage to material, which with a geared tool could not be avoided.

Precautions Against Freezing.—The objection sometimes urged against hydraulic machinery, especially when required for outdoor use, is that the water will freeze, and either choke or burst the working parts. In actual practice, however, little trouble is experienced when proper precautions are taken. It is well understood that, since water expands in freezing, it will require a much lower temperature to freeze it when under pressure, as pressure resists expansion; and, in fact, it is very difficult to freeze water in a pipe under 1500 pounds pressure—which is usually employed for portable outdoor machinery. There is danger from freezing of cylinders and pipes in which waste water is standing without pressure. It is therefore desirable—for this reason as well as to make sure that the water is always clean—to return the exhaust water to a tank (which may, in the case of portable tools, be done by a rubber hose), and use it over and over again, which permits the use of a percentage of glycerine, usually about 10 to 20, which effectually prevents freezing at ordinary winter temperatures. Another method frequently employed is the use of mineral oil in the system during the severe winter months, although this is usually found disagreeable. Ordinarily such precautions are not necessary; as in a properly equipped system there are facilities provided for draining cylinders and pipes which retain waste water when machines are idle for any length of time; and freezing cannot occur when the system is ordinarily active. For fixed machinery, such as lifts, cranes, etc., when outdoors, the cylinders should always be placed below the surface of the ground. Any necessarily exposed parts containing water can be cased in with non-conducting material. Experience obtained in our own Works with about twenty outdoor hydraulic cranes, lifts, etc., for many years, enables us to speak with confidence.

Compressibility of Water.—While water is, for all practical purposes, usually considered incompressible, yet if a machine is to be operated from a distance under high pressure, the slight compression of the volume, together with the expansion of the pipes and cylinders subject to high pressure, will cut an important figure, which must not be overlooked. In any case where variations in volume of water supplied under varying pressures would affect the action of the machine unfavorably, it is necessary to provide automatic arrangements for overcoming this difficulty.

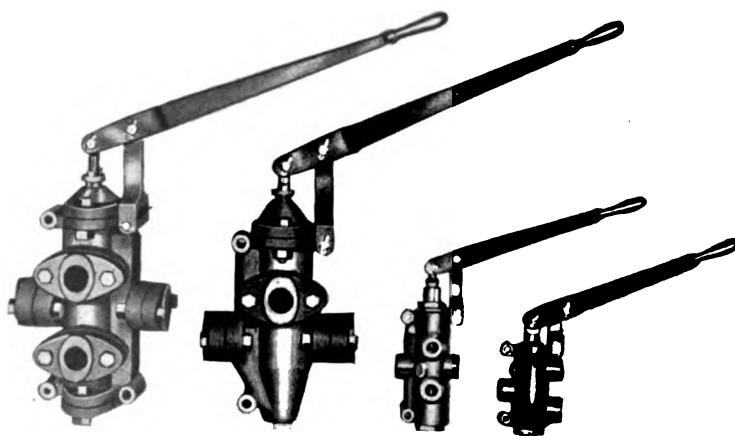
Relief Valves.—When water reaches a machine through a long line of pipe, and especially when the machine takes a large quantity of water quickly, it is necessary to provide against the shock produced by the sudden stoppage of the long water column, which otherwise will cause vibration and leakage of joints. For such cases spring relief or safety valves should be provided. Suitable valves for this purpose are described on page 20 of this volume.

Inquiries should state size of main, water pressure, and distance of machine from accumulators.

THE SHEM HYDRAULIC OPERATING VALVE.

Patented.

(Code Word, "Minutaglia.")



2½" FOUR-WAY. 2½" THREE WAY. | 1" FOUR-WAY. 1" THREE-WAY.
750 Lbs. Pressure. | 1500 Lbs. Pressure.

THESE valves are of the leather packed balanced piston type, and are designed for hard and continuous service for any pressure up to and including those named above. They have given entire satisfaction during the six years we have been making them, one prominent steel works alone having over one hundred of various sizes in service.

They are made both three-way and four-way, each style having only one spindle. The three-way valve has three and the four-way valve four cup leathers.

The arrangement of the ports, passages and cup leathers is such as to give the greatest possible durability. When the cup leathers are passing a port the flow of the water tends to keep them away from the port,—a point of vital importance. They are easy to operate and are readily accessible; a worn cup can be replaced in a few minutes. They are made with the greatest care, of the best grade of materials, and are under rigid inspection. Each valve is thoroughly tested before shipment.

The arrangement of the hand lever, link and end of stem permits the hand lever to point out on either side, and to move in the desired direction to either open or close the valve. This is a practical point which will be appreciated when valves are arranged in pulpit form.

The size of the pipe to the pressure and cylinder connections is the same as the nominal diameter of the valve, and the exhaust pipe is of the next larger size.

The valves for 1500 pounds working pressure have a short stroke and quick opening, being especially adapted for use on hydraulic riveters, presses and punching and shearing machinery. They have bronze shells and bronze working parts, and are regularly made—both three-way and four-way—in the following sizes: $\frac{1}{2}$ ", $\frac{3}{4}$ ", 1", $1\frac{1}{4}$ " $1\frac{1}{2}$ " and 2".

The valves for 750 pounds pressure have a long stroke and gradual opening, being particularly adapted for use on hydraulic cranes, lifts, etc. They have shells of close grained cast iron lined with bronze and bronze working parts, and are regularly made—both three-way and four-way—in the following sizes: $1\frac{1}{4}$ ", $1\frac{1}{2}$ ", 2", $2\frac{1}{2}$ " and 3".

Our 4", 5" and 6" valves are made with actuating cylinders. For description and cut, see page 18. They are made to order only.

For pulpit and floating lever valves, see pages 16, 17 and 20. For quick exhaust valves, see also page 18. For list of dimensions of standard valves, see pages 14 and 15.

We are prepared to make special valves for any purpose or pressure promptly; or our regular valves can be modified to suit special requirements.

Inquiries and orders for valves should be careful to state the working pressure and what service they are required to perform.

PRICE LIST FOR HYDRAULIC OPERATING VALVES.

Working pressure, 1500 pounds per square inch.

BRONZE SHELLS.

SCREW CONNECTIONS.

THREE-WAY			FOUR-WAY		
Code Word	Size	Price	Code Word	Size	Price
Miratrix	$\frac{1}{2}$ "	\$30.00	Misgradito	$\frac{1}{2}$ "	\$45.00
Mirrales	$\frac{3}{4}$	45.00	Misperava	$\frac{3}{4}$	65.00
Mugolava	1	60.00	Muladares	1	85.00
Mugriento	$1\frac{1}{4}$	90.00	Mulateiro	$1\frac{1}{4}$	120.00
Mujeracha	$1\frac{1}{2}$	120.00	Mulcebo	$1\frac{1}{2}$	150.00
Mujeriles	2	160.00	Mulcemus	2	200.00

PRICE LIST FOR HYDRAULIC OPERATING VALVES.

Working pressure, 750 pounds per square inch.

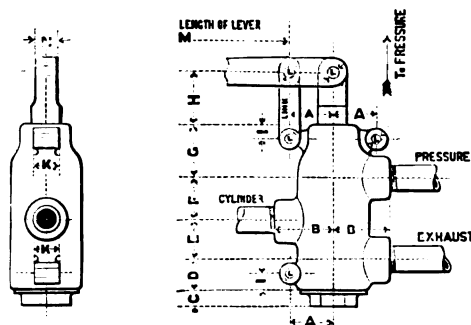
CAST IRON SHELLS, FLANGED CONNECTIONS WITH COMPANION FLANGES.

THREE-WAY			FOUR-WAY		
Code Word	Size	Price.	Code Word	Size	Price
Mulcenda	$1\frac{1}{4}$ "	\$90.00	Mulgemur	$1\frac{1}{4}$ "	\$120.00
Mulctrum	$1\frac{1}{2}$	120.00	Mulgenda	$1\frac{1}{2}$	150.00
Mulesche	2	160.00	Mulherlgo	2	200.00
Mulettino	$2\frac{1}{2}$	200.00	Muliebrity	$2\frac{1}{2}$	250.00
Mulgebat	3	240.00	Mulinava	3	300.00

Discount quoted on application.

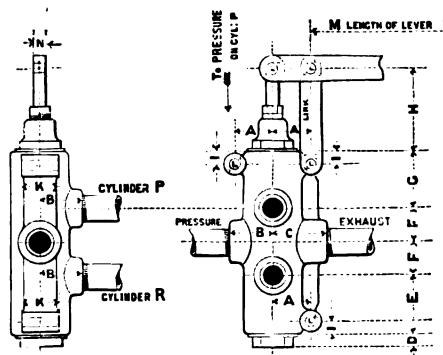
TABLES OF DIMENSIONS OF VALVES.

WORKING PRESSURE, 1500 LBS. PER SQUARE INCH.



THREE-WAY VALVES.—BRONZE SHELLS, SCREW CONNECTIONS.

THREE-WAY VALVES—PRESSURE, 1500 LBS.														Stroke of Piston
Size of Valve	A	B	C	D	E	F	G	H	I	K	L	M	N	
$\frac{1}{2}$ "	$1\frac{3}{4}$	2	$\frac{5}{8}$	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{3}{4}$	$1\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{4}$	$\frac{1}{2}$	$13\frac{1}{2}$	$1\frac{1}{4}$	$1\frac{1}{4}$ "
$\frac{3}{4}$	2	$2\frac{1}{2}$	$\frac{3}{4}$	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{1}{2}$	$\frac{1}{2}$	1	$\frac{3}{8}$	16	$1\frac{1}{2}$	$1\frac{1}{2}$ "
1	$2\frac{1}{4}$	$2\frac{3}{8}$	$\frac{3}{4}$	$1\frac{5}{8}$	$1\frac{3}{4}$	$1\frac{1}{2}$	$2\frac{3}{8}$	$2\frac{1}{2}$	$\frac{1}{2}$	1	$\frac{3}{8}$	$18\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{3}{4}$ "
$1\frac{1}{4}$	$2\frac{1}{2}$	$3\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{7}{8}$	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$\frac{3}{4}$	22	2	2
$1\frac{1}{2}$	3	$3\frac{3}{8}$	$1\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{3}{8}$	$3\frac{1}{4}$	$4\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$\frac{3}{4}$	$22\frac{1}{2}$	$1\frac{1}{2}$	$2\frac{1}{4}$ "
2	$3\frac{1}{4}$	$4\frac{1}{2}$	$1\frac{3}{8}$	$2\frac{3}{8}$	$3\frac{1}{4}$	$3\frac{1}{4}$	4	$4\frac{1}{4}$	1	$1\frac{3}{4}$	1	35	$1\frac{1}{2}$	$2\frac{1}{4}$ "

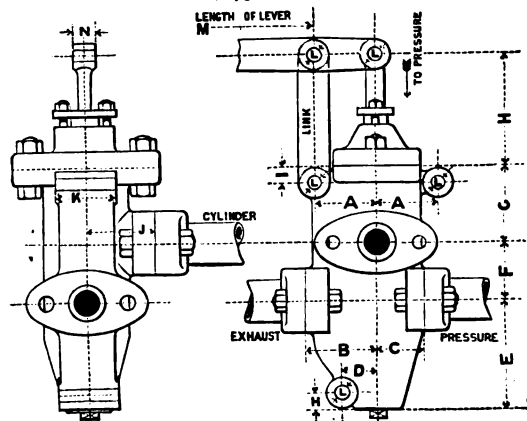


FOUR-WAY VALVES.—BRONZE SHELLS, SCREW CONNECTIONS.

FOUR-WAY VALVES—PRESSURE, 1500 LBS.														Stroke of Piston
Size of Valve	A	B	C	D	E	F	G	H	I	K	L	M	N	
$\frac{1}{2}$ "	$1\frac{3}{4}$	2	$2\frac{5}{8}$	$\frac{5}{8}$	$2\frac{3}{8}$	$1\frac{3}{8}$	$2\frac{3}{8}$	$3\frac{5}{8}$	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{1}{2}$	$13\frac{1}{2}$	$1\frac{1}{4}$	$1\frac{1}{4}$ "
$\frac{3}{4}$	2	$2\frac{1}{4}$	$2\frac{3}{8}$	$\frac{3}{4}$	$2\frac{1}{8}$	$1\frac{1}{2}$	$2\frac{1}{8}$	$4\frac{1}{4}$	$\frac{3}{4}$	$1\frac{3}{4}$	$\frac{3}{8}$	16	$1\frac{1}{2}$	$1\frac{1}{2}$ "
1	$2\frac{1}{4}$	$2\frac{1}{2}$	$3\frac{3}{8}$	$\frac{3}{4}$	$3\frac{3}{8}$	2	$3\frac{3}{8}$	$4\frac{1}{2}$	$\frac{3}{4}$	$2\frac{1}{8}$	$\frac{3}{8}$	$18\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{3}{4}$ "
$1\frac{1}{4}$	$2\frac{1}{2}$	$3\frac{1}{4}$	$3\frac{3}{4}$	$1\frac{1}{2}$	$3\frac{1}{2}$	$2\frac{3}{8}$	$3\frac{1}{8}$	$5\frac{1}{4}$	$\frac{3}{4}$	$2\frac{3}{8}$	$\frac{3}{4}$	22	2	2
$1\frac{1}{2}$	3	$3\frac{3}{8}$	$4\frac{3}{8}$	$1\frac{1}{4}$	$4\frac{3}{8}$	3	$4\frac{3}{8}$	$6\frac{3}{4}$	$\frac{3}{4}$	$3\frac{1}{4}$	$\frac{3}{4}$	$22\frac{1}{2}$	$1\frac{1}{2}$	$2\frac{1}{4}$ "
2	$3\frac{1}{4}$	$4\frac{1}{8}$	$5\frac{3}{8}$	$1\frac{3}{8}$	$4\frac{1}{4}$	$3\frac{3}{4}$	$4\frac{1}{4}$	5	$\frac{7}{8}$	$3\frac{3}{4}$	$\frac{7}{8}$	35	$1\frac{3}{8}$	$2\frac{1}{4}$ "

TABLES OF DIMENSIONS OF VALVES.

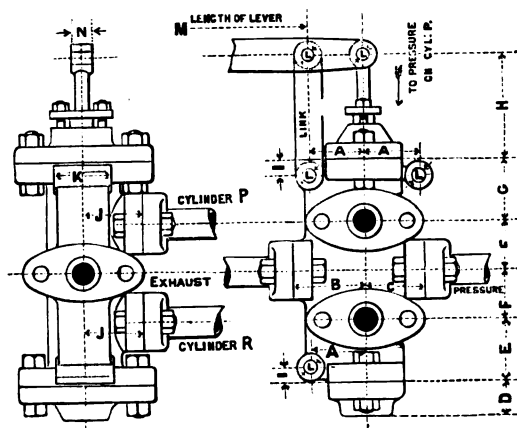
WORKING PRESSURE, 750 LBS. PER SQUARE INCH.



THREE-WAY VALVES.—CAST IRON SHELLS, FLANGED CONNECTIONS WITH COMPANION FLANGES.

THREE-WAY VALVES—PRESSURE, 750 LBS.

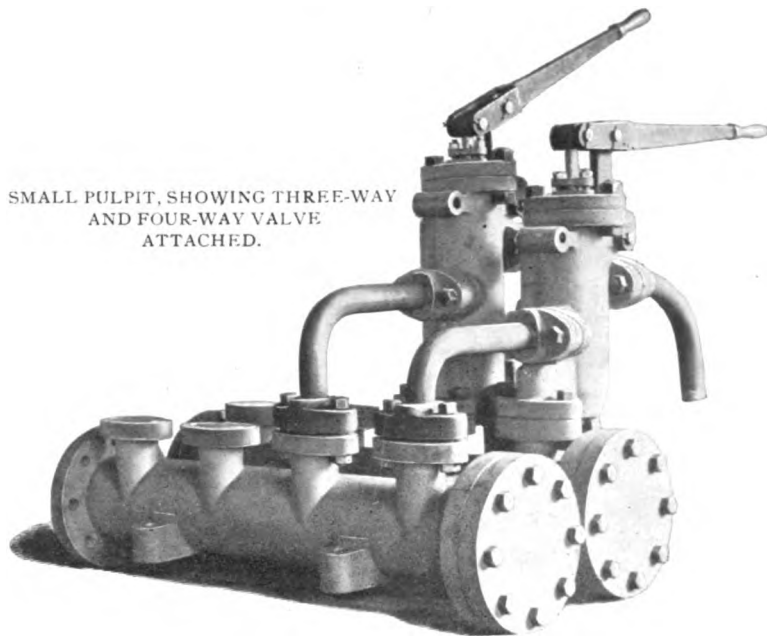
Size of Valve	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Stroke of Piston
1 1/4"	3 1/4	4 1/4	3 1/2	2 1/8	5 1/8	2 7/8	3 3/4	6 1/8	7/8	3 1/2	3 5/8	3/4	22	1 1/4	2 1/2"
1 1/2	3 3/8	4 1/2	3 3/4	2 1/4	6 3/8	3 3/8	4 3/8	6 1/2	1	4	3 5/8	7/8	24	1 1/4	3
2	3 3/4	4 7/8	4 1/4	2 1/2	8	4 3/8	5 3/8	7 1/8	1	4 1/2	4 5/8	7/8	30	1 1/4	4
2 1/2	4 1/2	5 3/4	5	3 1/2	9 1/4	4 7/8	5 7/8	8 3/8	1 1/8	5 1/8	5 1/8	1	33	1 3/8	4
3	5 1/4	6 3/4	5 3/4	4	10	4 1/2	6 3/8	9	1 1/8	5 3/4	6 1/8	1	41	1 1/2	4 1/2



FOUR-WAY VALVES.—CAST IRON SHELLS, FLANGED CONNECTIONS WITH COMPANION FLANGES.

FOUR-WAY VALVES—PRESSURE, 750 LBS.

Size of Valve	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Stroke of Piston
1 1/4"	3 1/4	4 1/4	3 1/2	1 7/8	3 3/4	2 7/8	3 3/4	6 1/8	7/8	3 1/2	3 5/8	3/4	22	1 1/4	2 1/2"
1 1/2	3 3/8	4 1/2	3 3/4	2	4 1/4	3 3/8	4 1/4	6 1/2	1	4	3 5/8	7/8	24	1 1/4	3
2	3 3/4	5	4 1/2	2	5 1/4	3 3/4	5 1/4	6 3/4	7/8	4 1/2	4 5/8	7/8	30	1 1/4	3 1/4
2 1/2	4 1/2	5 3/4	5	2 1/8	5 1/2	4 1/8	5 1/2	7 3/8	1 1/8	5 1/8	5 1/8	1	33	1 3/8	3 1/2
3	5 1/4	6 3/4	5 3/4	2 1/2	6 3/8	5 1/4	6 3/8	8 3/8	1 1/8	5 3/4	6 1/8	1	41	1 1/2	4 1/2

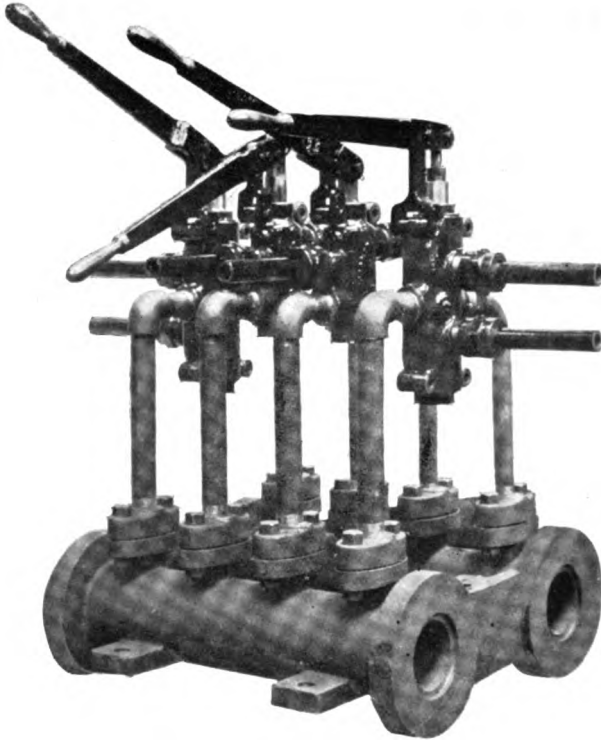
PULPIT VALVES.(Code Word, "**Miterone.**")SMALL PULPIT, SHOWING THREE-WAY
AND FOUR-WAY VALVE
ATTACHED.

THIS cut illustrates valve construction as adapted to Steel Works pulpits or for any purpose where several valves are to be nested together for operating one or more machines from the same stand. This arrangement affords the greatest possible facility for connecting up, all the joints being perfectly accessible, there being none whatever between the valves, which are by this means brought as closely as possible together. The connections are arranged so that the levers can be operated from either side of the pulpit. The valves are all ranged over the exhaust chamber, with elbow connections to the pressure side. When specially desired, gate valves can be placed between the valves and the pulpit on both pressure and exhaust connections. The cut shows both the three-way and four-way valve. In the latter valve the machine connections are located one over the other, on the side toward the operator, the pipes passing downward under the floor.

Pulpit or Valve-Stand (^{Code Word,}**Mitescant.**)—In ordering pulpits always state:

1. The number of valves for which provision should be made in the pulpit.
2. The size of the valves or the size and speed of the rams or pistons they have to operate.
3. Whether three-way or four-way valves are required (*i.e.*, whether for operating single-acting rams or double-acting pistons).
4. The water pressure.
5. Whether all the valves are for the several motions of one machine or for several machines (in the latter case it is customary to use stop valves on both pressure and exhaust side of each operating valve).
6. Whether it is desired to place the operator on a level with the valves or on a platform elevated above them.

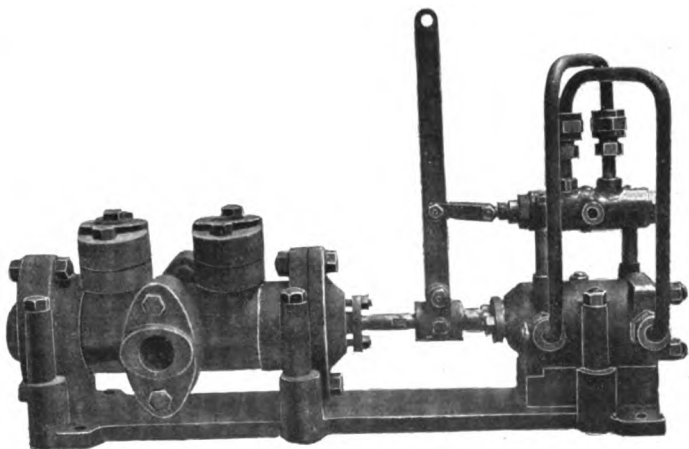
PULPIT VALVES.



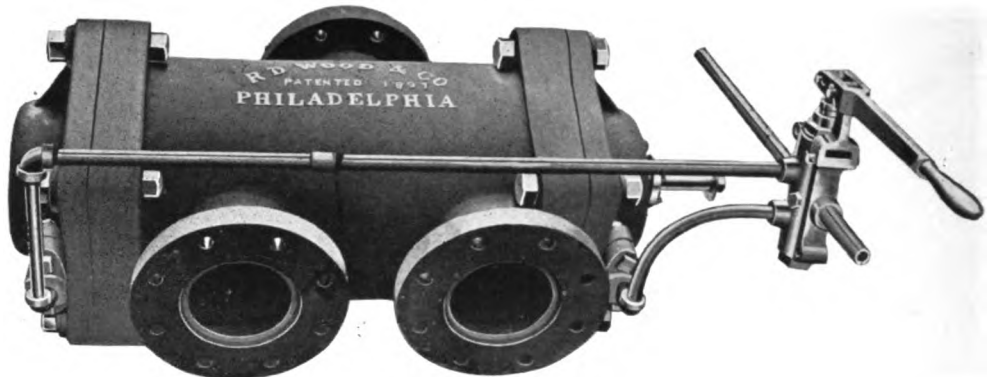
SMALL PULPIT, SHOWING 2 THREE-WAY AND 2 FOUR-WAY VALVES ATTACHED.

OUR valves can be connected to pulpit as here shown, which arrangement permits the use of our standard valves and assures prompt delivery.

WE show here our standard valve equipped with pilot valve, floating lever and actuating cylinder. This construction is used where the operating valve is too large to be easily moved by hand, and yet must possess all the advantages of a hand-controlled valve. This is accomplished by connecting the pistons of the operating and pilot valves in the manner shown, thus putting the operating valve under as perfect control as if it were moved directly by hand.



FOUR-WAY VALVE WITH PILOT VALVE AND FLOATING LEVER.



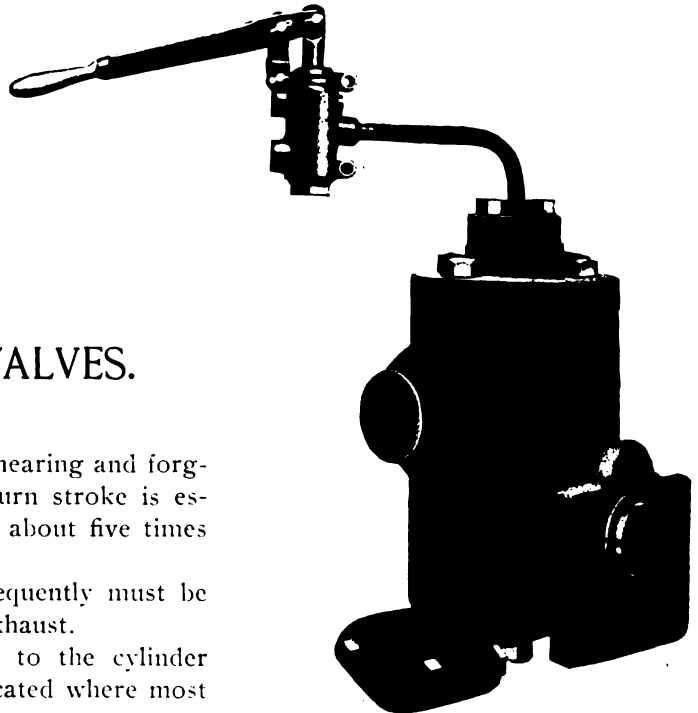
BALANCED THREE-WAY VALVE WITH PILOT VALVE.
Working pressure, 750 pounds per square inch.

THESE valves contain in themselves the actuating cylinders, and the pilot valves can be located at any distance from the operating valves. If so desired, they can be equipped with floating levers. They are made in the following sizes: 4", 5" and 6".

Prices and dimensions upon application.

CODE WORDS

3-WAY.		4-WAY.	
Size.	Code Word.	Size.	Code Word.
4"	Muricino.	4"	Muscipula.
5"	Murucuya.	5"	Muscoletto.
6"	Muschioso.	6"	Muscoino.



QUICK EXHAUST VALVES.

DESIGNED for heavy punching, shearing and forging machines where a rapid return stroke is essential; the area of the exhaust being about five times that of the pressure pipe.

They are not balanced and consequently must be either wide open to pressure or to exhaust.

They are usually bolted directly to the cylinder they control, the pilot valve being located where most convenient for operator.

Made only to suit requirements.

QUICK EXHAUST VALVE, 3000 LBS. PER SQ. IN.
WORKING PRESSURE.

CARE OF VALVES.

IT is only necessary that a good valve be furnished with a fairly clean supply of water, free from grit. With this point in view, it is usual to filter the water used, returning the exhaust to the pump suction tank, and using it over and over again. If this plan, which we strongly recommend, is adopted, but little other care is required. The facility of operation can be greatly increased, and the durability of the cup leathers prolonged, by occasionally taking apart the valve and doping the parts with tallow; also by occasionally placing in the supply tank a small quantity of glycerine or soft soap.

SWIVELS, OR WALKING PIPE JOINTS.

(Code Word, **"Mitigamus."**)

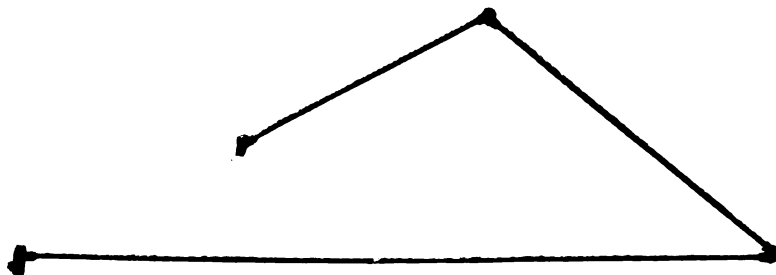


PLAIN.



WITH FOOT.

Sizes, $\frac{1}{4}$ ", $\frac{3}{4}$ ", 1", $1\frac{1}{4}$ " and $1\frac{1}{2}$ "; working pressure, 1500 pounds per square inch. In ordering state kind required.



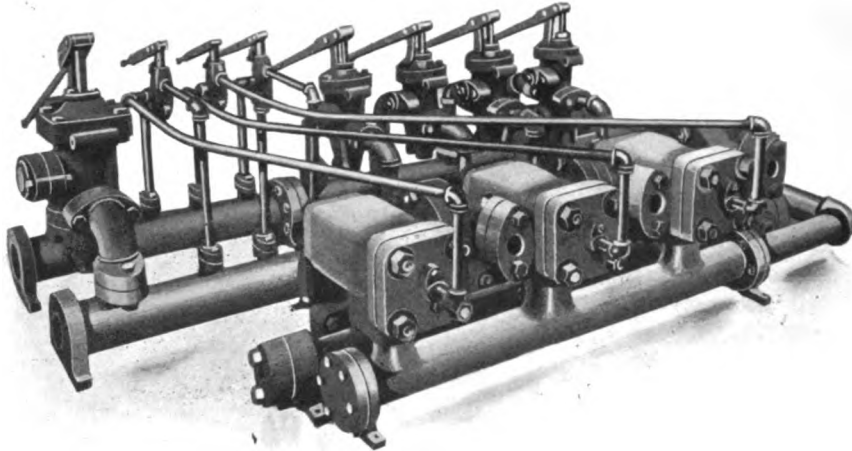
$\frac{1}{2}$ " Walking Pipe, for 1500 pounds pressure per square inch.

WE construct a complete line of swivels, carefully made of bronze for pressures up to 1500 pounds per square inch. Supplied complete with walking pipes when so ordered.

Swivels for heavier pressures to order, or modifications of our standard to suit customers' requirements. Also flexible copper coils.

* For sizes, use Code, pages 89-91.

MANIFOLD AND PULPIT.



THE above illustration is of a large manifold and pulpit for operating a special hydraulic machine. It is interesting because of the number, size and variety of valves, consisting of quick exhaust valves, three-way and four-way valves of various sizes, pilot valves and check valve.



PRESSURE RELIEF VALVE.

AFTER a careful study of methods of relieving hydraulic plants under heavy pressure of the shocks produced by the sudden starting and stopping of the water column, we have adopted the plunger type of relief valve, as shown by the accompanying illustration. The plunger operates through a stuffing box of ample depth, and its movement is controlled by a number of heavy springs. The movement of the plunger allows no water to escape from the system, for as soon as the excess pressure is relieved the plunger returns to its original position.

LEATHER PACKINGS.



SINGLE CUP PACKING.



DOUBLE CUP PACKING.



FLANGE PACKING.

WE make leather cup packings of all sizes and descriptions, from carefully prepared material, dressed to our own specifications. Outside of the standard sizes used on our own valves and machinery, we have a large variety of die blocks, from which we are enabled to meet a demand for almost any ordinary size, either single, flange or double cup. The making of good, durable cup packing is a matter requiring considerable experience. In the majority of cases where there is trouble from leather packings it comes from defective cups, made either from improper material or by improper methods, rather than from defective construction of machine or valve.

MOLDS FOR LEATHER PACKING.

IF our customers prefer to make the leather cup packings themselves, we are prepared to furnish molds of the most approved design, either for our own valves and machinery, or for any desired sizes and shapes.

RAMS AND CYLINDERS.



Ram is 16" diameter, 24' stroke.

WE make a specialty of hydraulic rams and cylinders up to 40 feet in length, when of sufficient diameter and thickness, cast on end, machined and guaranteed proof against the heaviest pressures, and in which special mixtures, the result of long experience, are used. We have also a large variety of patterns and unequalled facilities for work of this class. Inquiries should be accompanied by prints or sketches, giving dimensions, pressures and other details.

We also supply rams complete with single or multiple sheaves, arranged to multiply the stroke as required.

MULTIPLE POWER HYDRAULIC PLATE SHEAR.

(Code Word, "Mochler.")

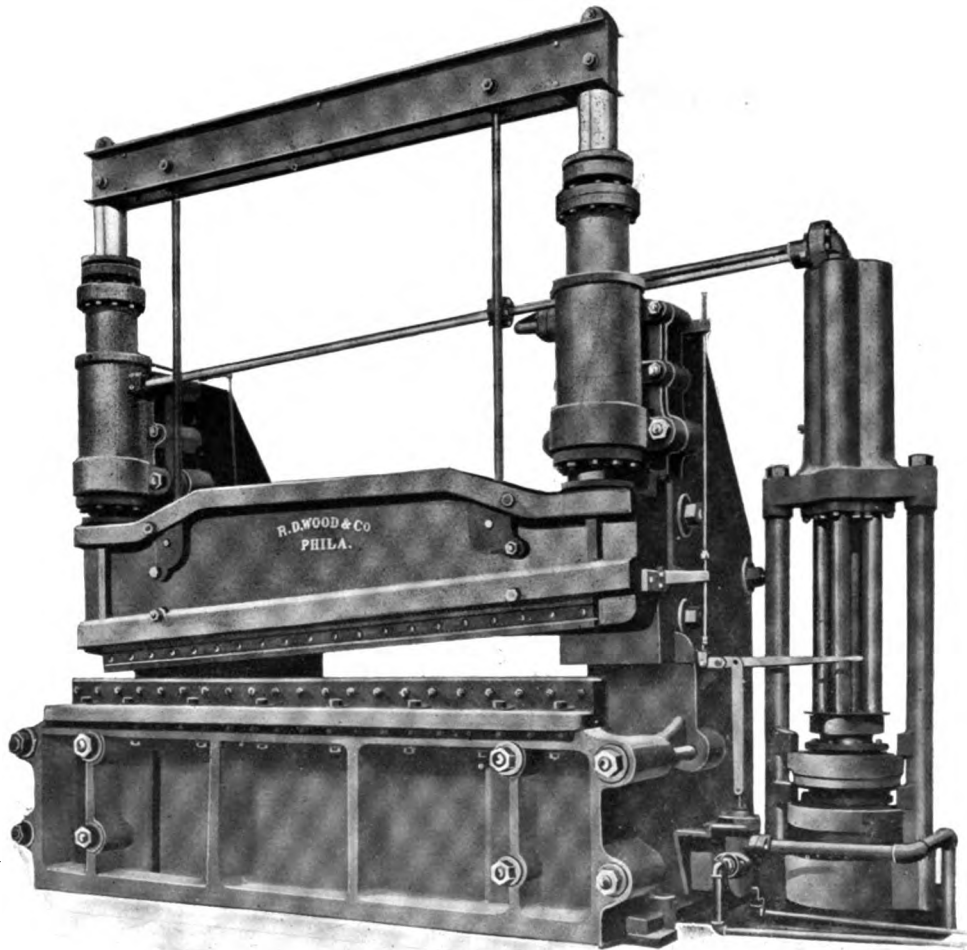
THE essential features of this shear consist of the direct application of the power to the knife without intervention of gears, eccentrics, clutches, levers or wedges, thus securing the highest possible efficiency in operation; the multiple power compound intensifier, which insures absolutely equal and simultaneous action of the two rams which operate the cutting knife regardless of the position of the point of resistance to the knife, and which also provides for the most economical operation of the tool by permitting the application of varying powers in shearing different thicknesses of plate; the arrangement of the upper knife holder, guides and bearings, which permits either end of the upper knife holder to make a complete stroke while the opposite end remains stationary should such a movement occur due to an accident; the arrangement of the operating valve so that it is automatically closed just as the upper knife holder reaches either end of its stroke, thus relieving the shocks which would otherwise result. The knives are made of the best grade shear steel and each has four cutting edges.

A scrap shear is provided, when desired, and mounted on rear of one of the main housings. It is operated by an independent cylinder and operating valve.

This tool is furnished of any desired capacity, depth of throat and width between housings, and also to be operated from any special base pressure within reasonable limits.

The design provides a tool entirely self contained as far as working strains are concerned and of absolute rigidity; it combines the utmost simplicity with the highest efficiency, the frictional losses having been reduced to a minimum.

Prices and detail specifications will be furnished upon application, accompanied by statement of conditions to be fulfilled.

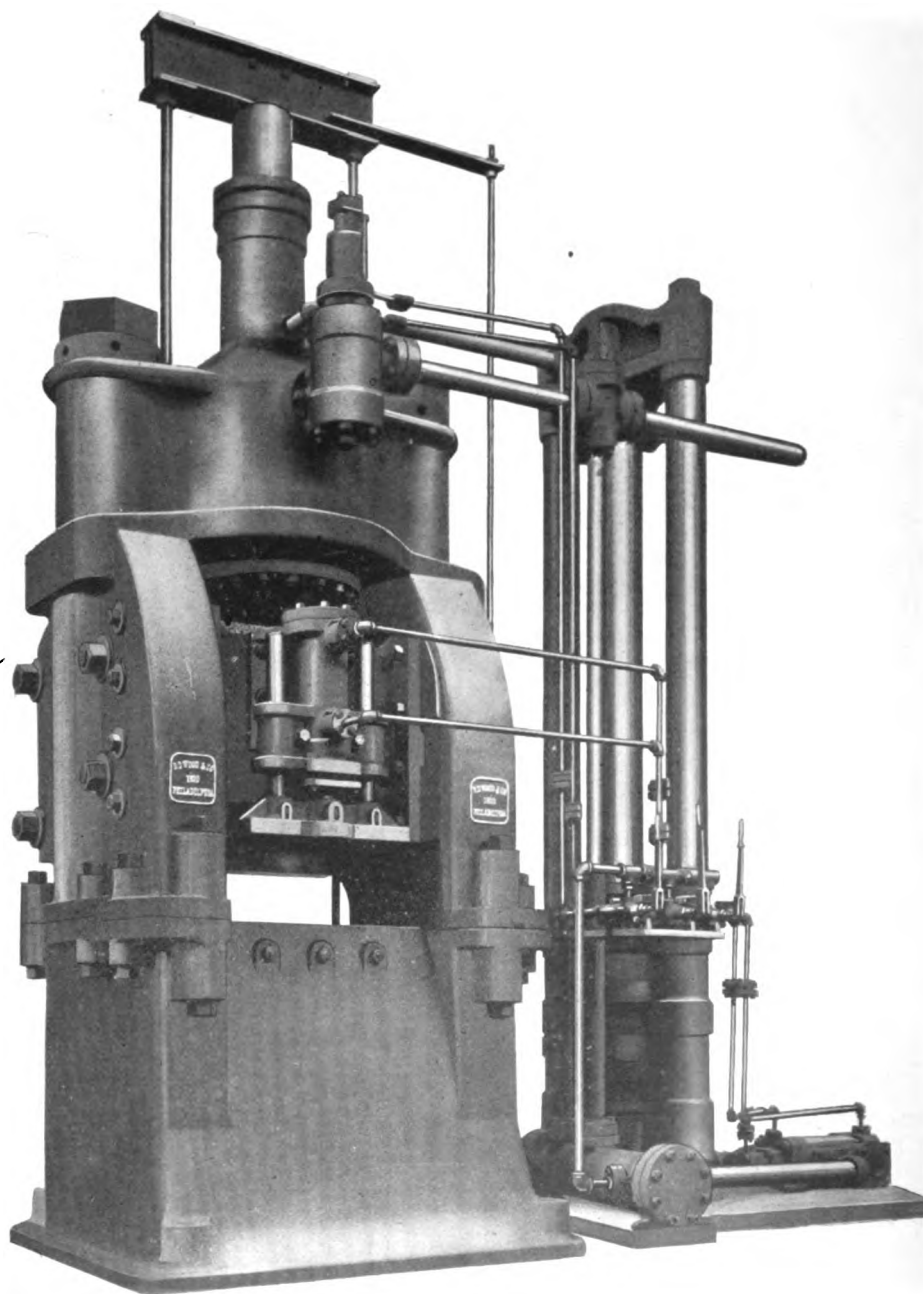


MULTIPLE POWER HYDRAULIC PLATE SHEAR.

Shem's Patent.

(Code Word, "Mochiler.")

The illustration is of a shear having capacity to cut all thicknesses of plate up to 2". The distance between housings is 11', and the knives are 14' long. The shear has a gap or depth of throat of 30". It is designed to operate from a base pressure of 500 pounds per square inch.



HYDRAULIC BILLET SHEAR, QUADRUPLE POWER.

HEAVY HYDRAULIC BILLET AND SLAB SHEARS.

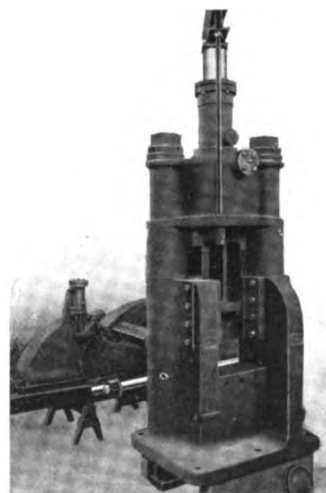
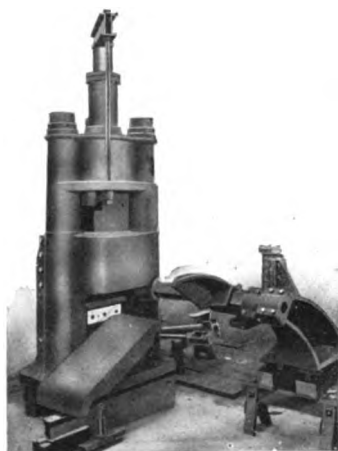
THE shear from which the preceding illustration was made is of one thousand tons maximum capacity and operates from a base pressure of 500 pounds. The shear has four powers, viz: 200, 400, 600 and 1000 tons. The knives are 36" long. With the maximum power it will shear up to 8" x 24"; with the minimum power it will shear from two to three 4" x 4" billets.

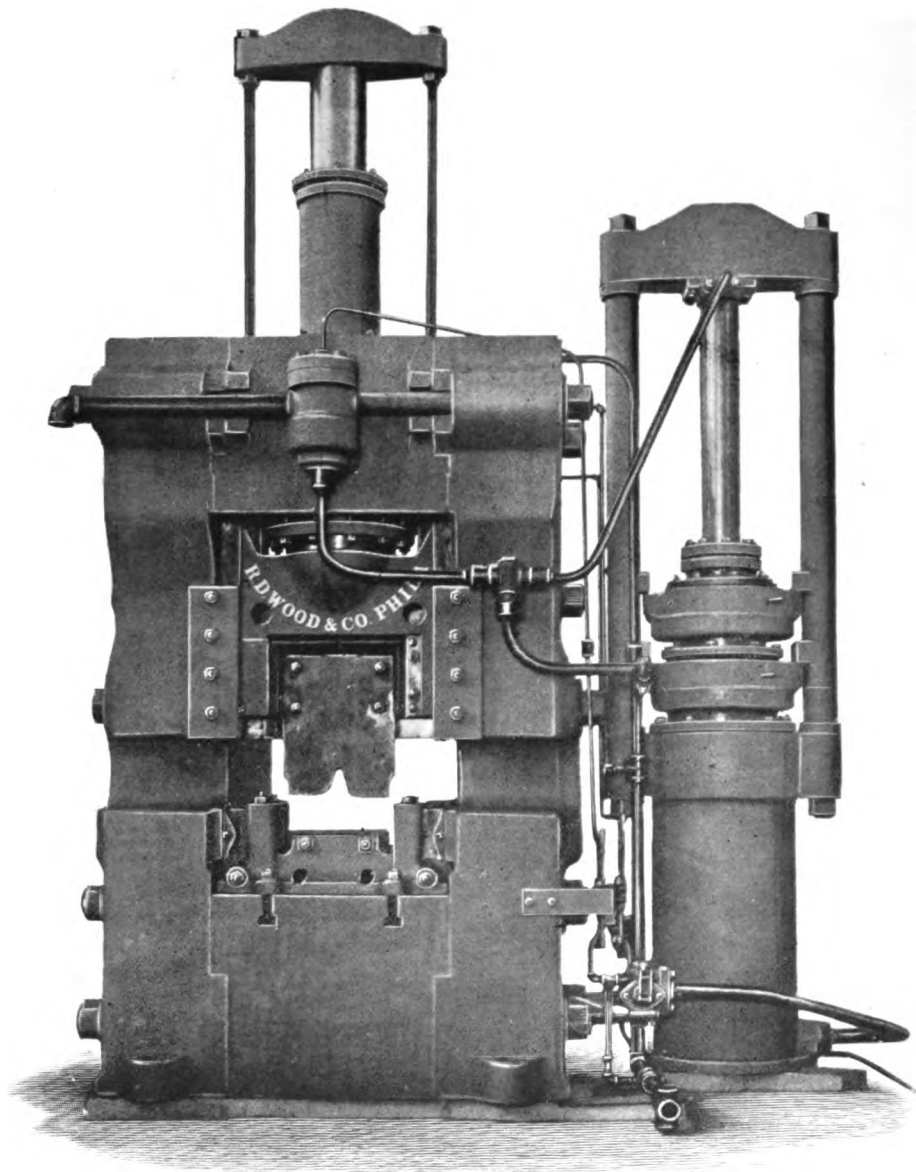
The special features of this design are:

Quickly adjustable stroke, thus reducing clearance to a minimum and economizing consumption of power; triple power intensifier which with the base pressure makes available four capacities, thus insuring further economy in power required for cutting varying sizes of billets or slabs; an arrangement whereby the operator can instantly, by pressing a lever, throw the shear to the top of its stroke to pass any twisted crop end without interruption or loss of time, after which the shear will automatically resume the length of stroke to which it had been previously set; an independent clamping ram operated by a four-way valve.

We also build heavy billet, slab and bloom shears operated by steam intensifiers.

The accompanying illustrations show a hydraulic billet shear of 750 tons capacity, with apron arranged to discharge the billets at one side, also with stop gauge operated by hydraulic power.





HYDRAULIC BEAM SHEAR AND TRIPLE POWER INTENSIFIER.

(Code Word, "Moccolino.")

(WITH OR WITHOUT JEFFERIES' PATENT COPING KNIVES.)

For cutting up to 24" I beams or channels. Designed for working under 400 to 500 lbs. pressure, the intensifier augmenting the pressure in steps, as duty requires.

THESE Hydraulic I-Beam Shears are now used in leading structural mills of the United States, in which, with marked success, they have displaced the former slow and expensive method of sawing. They are capable of driving a special knife through an I-beam of the heaviest section made, in the manner of a punch—that is, they make a clean cut on both sides of the knife, and do work suitable for the market in cutting beams to length. They are also arranged to work in the most economical manner, an essential feature for hydraulic machines of such high power. This is accomplished by means of our patent multiple intensifier.

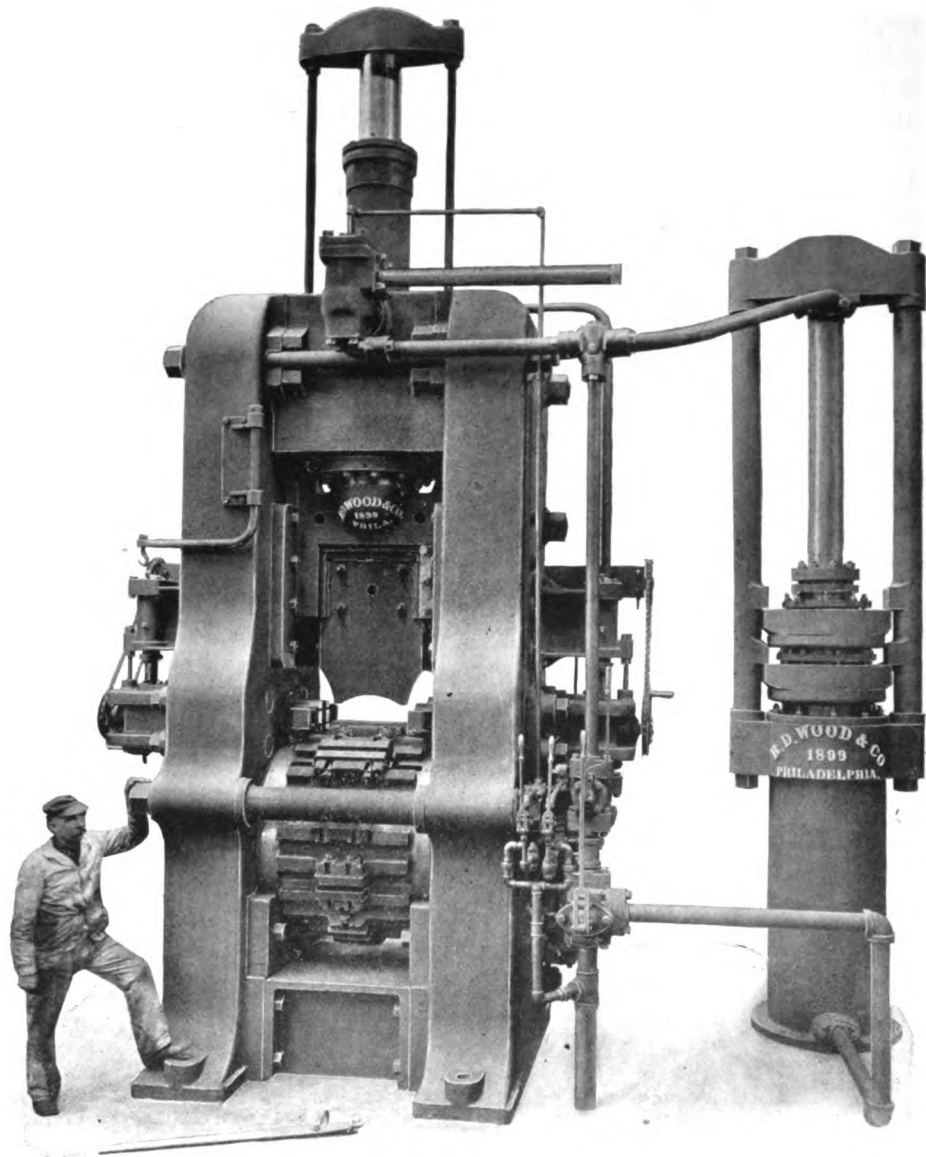
The main valve is of the four-way type, which thrusts the low-pressure water either directly into the cylinder of the machine, or into the cylinder of the intensifier, as required; thus the idle motion of the shear is performed by means of low-pressure water, the operator throwing the lever over when the knife strikes the beam. This action brings into play the intensifier, which is of triple power, its action being to multiply the original power due to the low-pressure water by two, three or four, as required by the size of the beam operated upon, which gives the machine a wide range of action on an economical basis. The discharge of water from the ram is performed quickly by means of the supplementary discharge valve, which is operated by a simple pivot valve at the operator's hand, which permits the return stroke of the shear to be made readily without having to discharge its water through the operating valve.

The beam, while being cut, is clamped firmly sidewise by two hydraulic rams, operating horizontally upon wedges, their motion being controlled by a simple valve alongside of the others, shown on the right of the engraving. The whole operation of putting in a beam, clamping it, cutting it off and releasing it is performed in a few seconds, and the wear and tear on the machine is almost *nil*—there are no wheels, no shafts, no trunnions, and no motion whatever except that absolutely necessary to cut the beam. These features, combined with the solid and rigid frame, which has no yield whatever under the forces employed, result in a machine well adapted for hard and continuous service.



24" I-BEAM. SHEARED AND COPED AT ONE STROKE.

Coping Knives (^{Code Word}_{..Mocceballs..}).—When desired, this machine is equipped with Coping Knives (patented), by means of which the flanges are cut off ("coped") by the same stroke that cuts to length; or, if the beam be of the required length, the Coping Knives will simply cut out the flanges. Thus at one stroke the beam is completely coped, top and bottom, in proper form to fit against a beam at right angles to itself.



UNIVERSAL HYDRAULIC BEAM SHEAR, TURRET TYPE.

(Code Word, "**Multesimo.**")

(WITH TRIPLE POWER INTENSIFIER.)

For cutting up to 24" I beams or channels. Designed for working under 400 to 500 lbs. pressure, the Intensifier augmenting this pressure in steps according to the size of beam to be cut.

Universal Beam Shear (Patented).—Designed for cutting all sizes of beams and channels within the range of its capacity without material loss of time in bringing the proper knives into position.

The essential features are:

A hollow revolving turret, carrying all the lower knives, so arranged that it may be revolved forward or backward by a hydraulic cylinder bringing the required knife into cutting position;

Upper knives so shaped that each knife will cut several sized beams, four knives being required for cutting beams up to and including 24";

Provision for readily changing the upper knives, when necessary, by means of a small davit and levers;

Side knives, fitted in bearings in the side housings and mounted on adjustable sliding bars, for clamping beams of all sizes;

An inclined chute projecting into the center of the hollow turret is attached to the housing for discharging all the clippings to one side of the machine.

Usually the time required to adjust the knives for cutting different sized beams is only a few seconds, and when necessary to change the upper knives only a few minutes are required.

The main cylinder, the arrangement of valves and intensifier and the other general details of the machine are similar to those described on page 27 for the ordinary I-beam shear.

Jobbing Beam Shear (Code Word, "Muraglione.").—We are now also prepared to furnish a beam shear designed for use in shipyards, bridge and structural shops generally, where only a comparatively limited quantity of any particular shape is to be cut. It will cut I-beams, channels, angles, tees, Z-bars or deck beams. The method of cutting is similar to that of the shears described previously. It will be sold at a very moderate cost, and will prove a most useful machine.

HORIZONTAL FLANGE PUNCH.

(Code Word, "Titansame.")

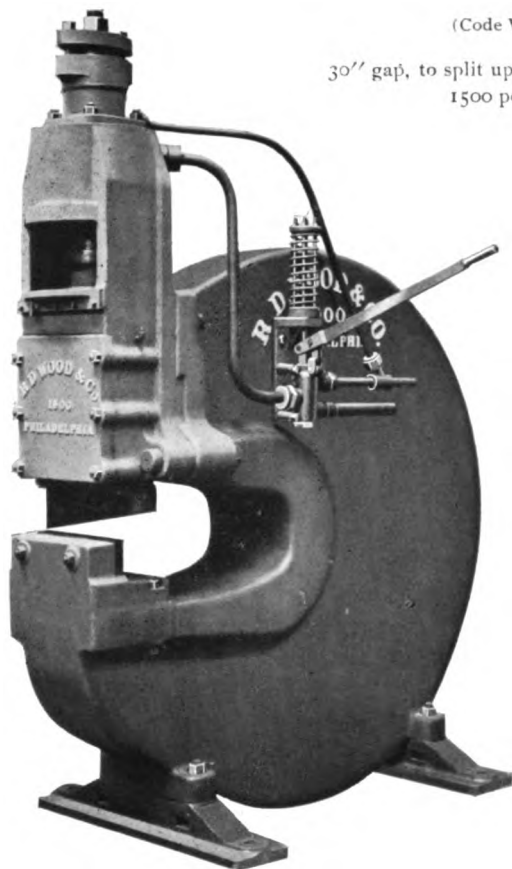


12" gap, to punch $1\frac{1}{4}$ " hole in $1\frac{1}{8}$ " plate; working pressure, 1500 pounds per square inch; entirely flush top.

HYDRAULIC SPLITTING SHEAR.

(Code Word, "Multimodo.")

30" gap, to split up to 1 1/4" plates; working pressure,
1500 pounds per square inch.



OUR latest design of this style of shear. It has a detachable outside flax-packed cylinder made of a single steel casting. The valve lever is so arranged that the operator can see the line to be sheared to, thus insuring rapid and accurate work. As the knife can be started, stopped or reversed at any portion of the stroke, thus permitting very short strokes, an inside curved edge can be sheared,—a point which will readily be appreciated.

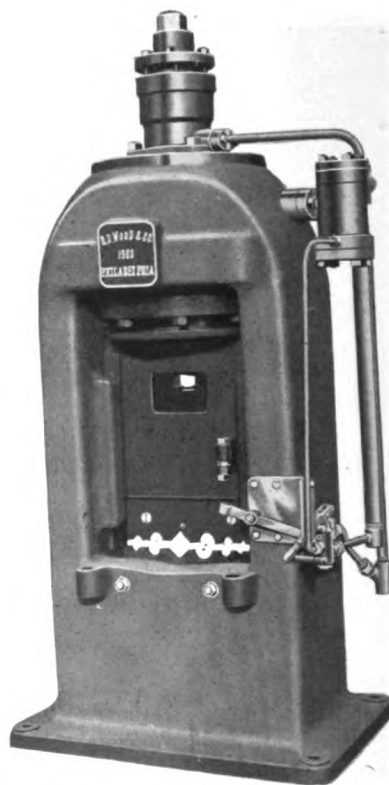
Various gaps and capacities.

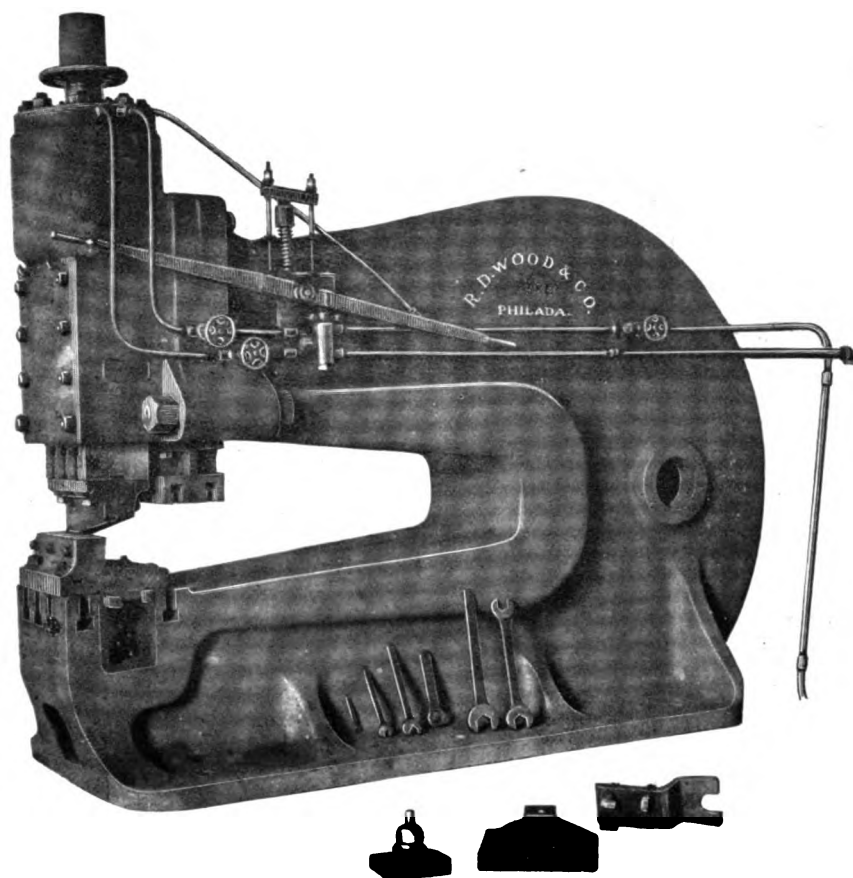
HYDRAULIC BAR SHEAR.

(Code Word, "Multivago.")

For cutting rounds up to 3" and squares up to 2 1/2", or plates 18" wide by 1 1/4" thick; working pressure, 1500 pounds per square inch.

THIS is a compact, rigid machine; the cylinders are outside flax-packed. It is equipped with quick exhaust valve, pilot valve and automatic return stroke for rapid work. A holding-down bar, gauge bar, a set of knives for shearing rounds and squares and a set of knives for shearing flats are furnished with each machine. Various sizes.



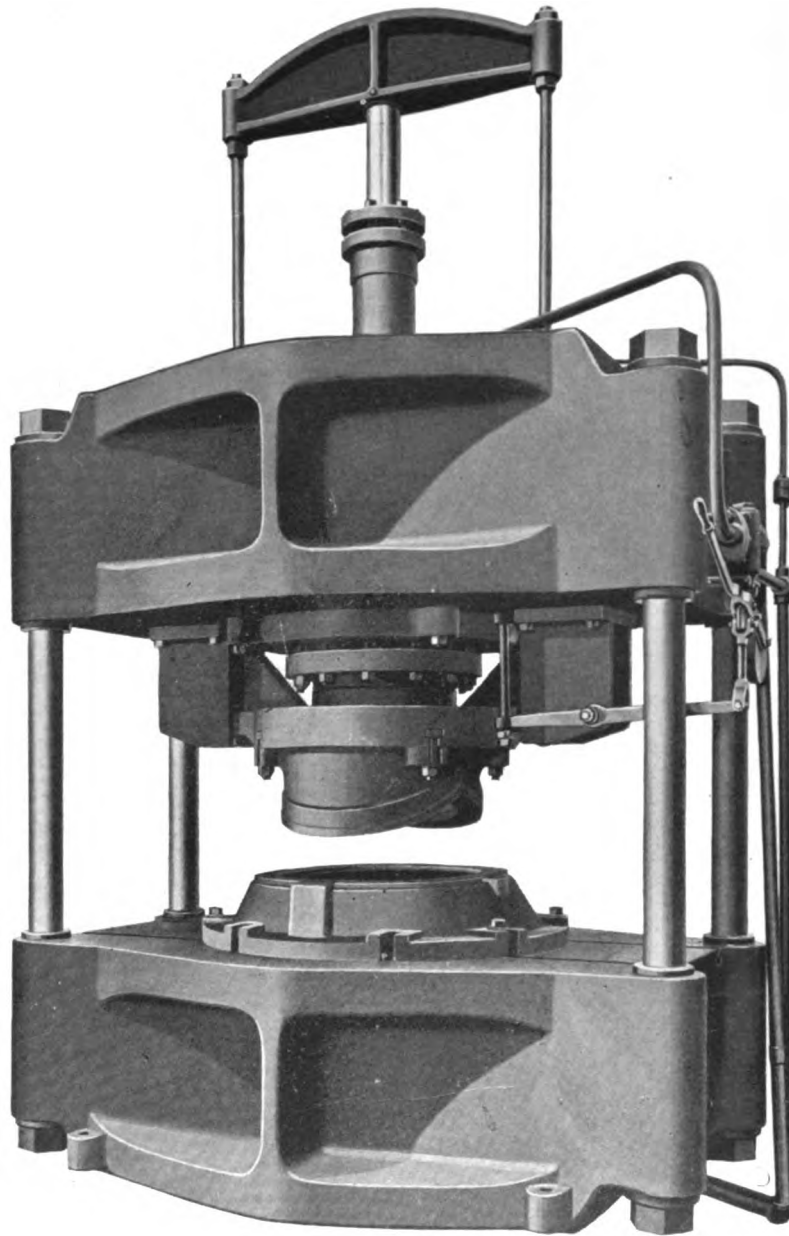


HYDRAULIC PUNCH AND SHEAR.

(Code Word, "Modelaria.")

Triple power ; gap, 60''; stroke, 6''; working pressure, 1500 pounds per square inch ;
standard gaps, 25'', 37'', 50'' and 60''.

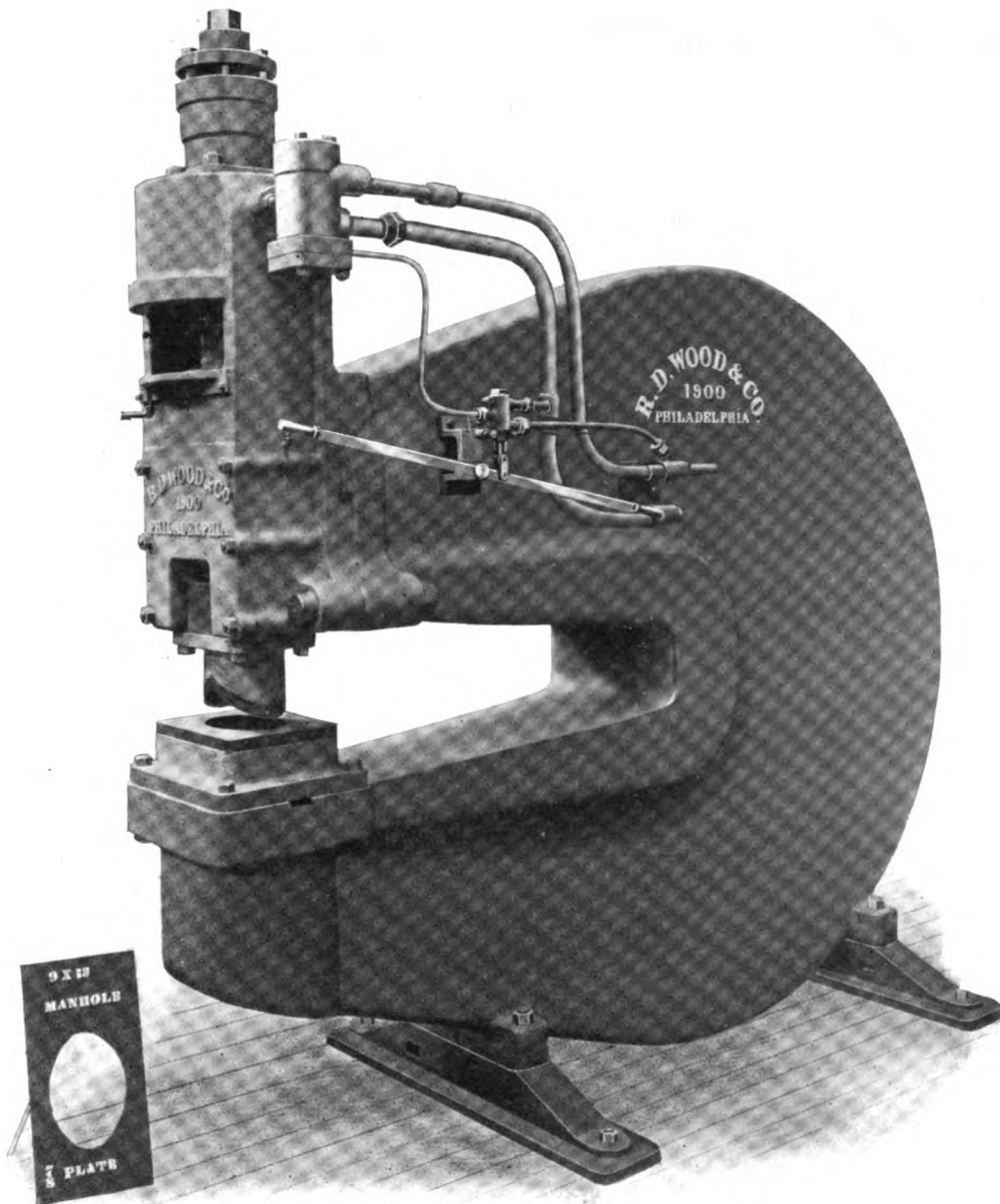
THIS machine is well adapted for general use. It is arranged either for single or multiple punching, and the lower jaw is cut away for punching I-beams up to 15''. As a shear it will split $\frac{3}{8}$ '' steel plate. The stroke is quickly adjustable to any length from 1'' to 6''.



LIGHTNING HOLE PUNCH.

(Code Word, "Multocular.")

Distance between columns, 8'; stroke, 13''; working pressure, 1500 pounds per square inch;
for punching holes 36'' by 24'' in $\frac{1}{2}$ '' steel plates, smaller holes in thicker plates;
especially adapted to shipbuilders' use.



HEAVY HYDRAULIC MANHOLE PUNCH OR SHEAR.

(Code Word, "Multopere.")

60" gap, for punching a 9" x 13" manhole in $\frac{3}{4}$ " steel plates or for shearing $1\frac{1}{4}$ " steel plates; working pressure, 1500 pounds per square inch.

THIS machine is of the same general design as the Splitting Shear, described on page 30. but in addition is equipped with quick exhaust valve and pilot valve. The stroke is quickly adjustable from 1" to 5". Various gaps and capacities.

GRAVES' HYDRAULIC PUNCH.

Patented.

(Code Word, "Mulviano.")

50" gap; $1\frac{1}{4}$ " hole in $1\frac{1}{4}$ " plate; working pressure, 1500 pounds per square inch.

THE leading features of this machine are:

An Automatic Stripper which descends on the plate, remains there until the hole is punched and the punch withdrawn from the plate, then rises $\frac{1}{4}$ " above the end of punch, leaving the latter free to engage in the next center punch mark:

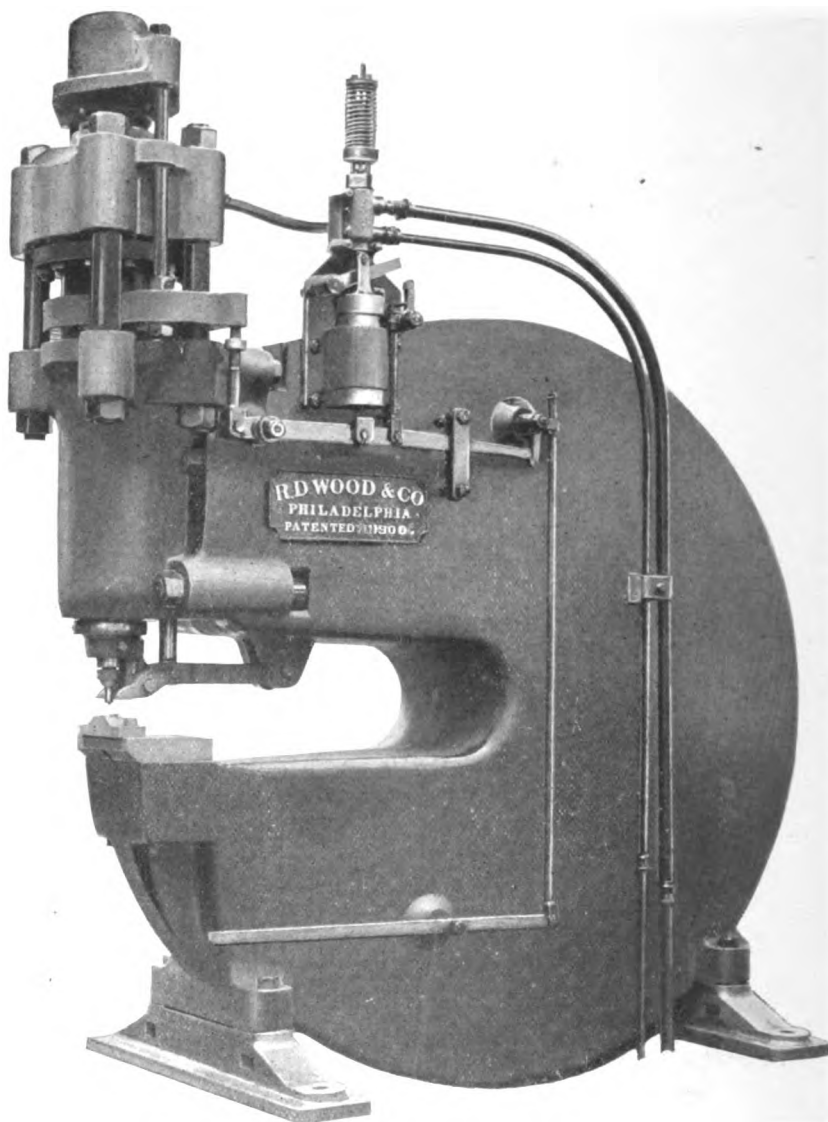
An Automatic Valve Motion which, to make a complete stroke including the return, requires but a very slight pressure of the foot exerted through about 2":

An Adjustable Stroke which can be quickly altered over a range of from $\frac{3}{4}$ " to $1\frac{1}{4}$ "; the same movement which changes the stroke also adjusts the stripper:

A Spring Pullback which relieves the shock when hard steel plates are being punched, reduces the number of wearing parts and stuffing boxes and permits of varying pullback power by adjusting tension of spring:

An Outside Flax-Packed Ram, with perfect arrangements for catching all drip, so that no leakage whatever descends about the tool.

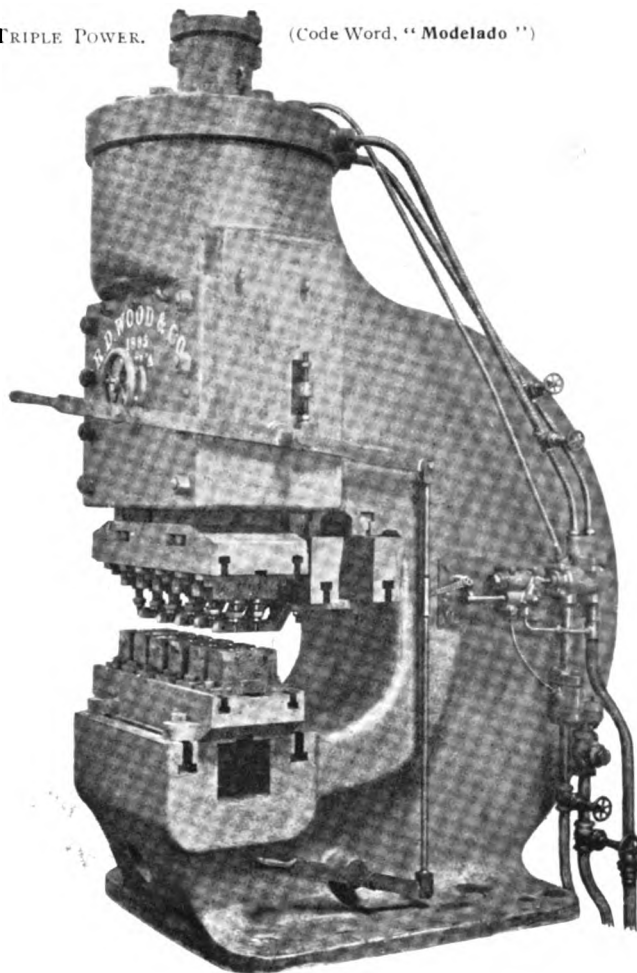
These punches are furnished with capacity of 65, 100 or 150 tons and with a depth of throat of 12" to 72".



HEAVY HYDRAULIC MULTIPLE PUNCH OR SHEAR.

TRIPLE POWER.

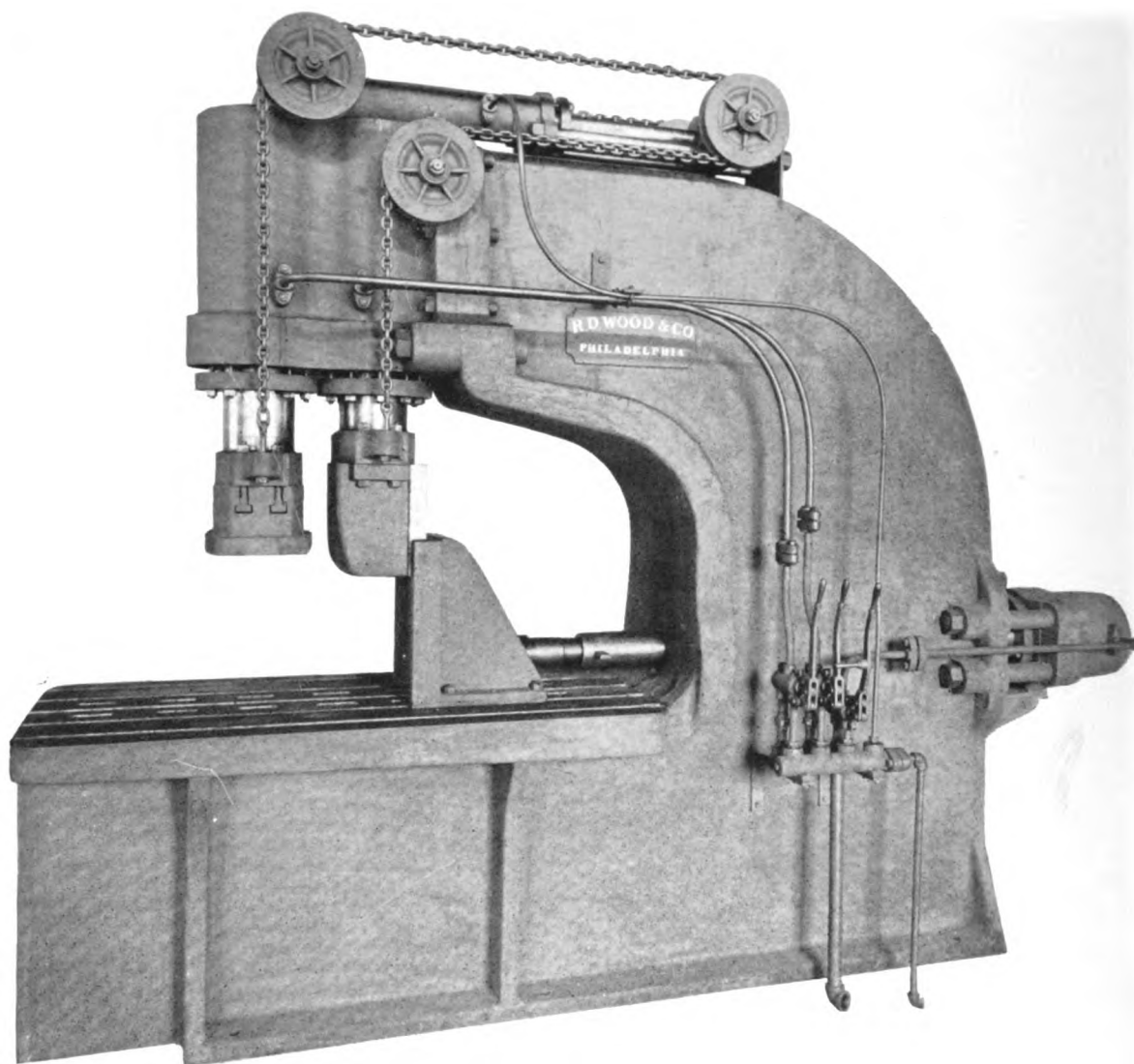
(Code Word, "Modelado")



As a *Punch*, this tool will put twelve $\frac{7}{8}$ " holes at once through $\frac{5}{8}$ " steel plate, or the equivalent ; as a *Shear*, it will split a $1\frac{1}{4}$ " soft steel plate at 24" from the edge ; working pressure, 1500 pounds per square inch ; larger machines to order.

THE machine here illustrated is designed for a large variety of uses, and is an exceptionally strong and durable tool. It exerts a maximum power of 180 tons, but its cylinder has differential areas, which permit it to work at either 60, 120 or 180 tons, as desired, using water only in proportion to work done. The stroke may be varied as required, from one inch to six inches, the change being made by a few turns of a hand-wheel. The machine is also arranged with an automatic return motion, and can be made to run continuously, if desired. It is rapid and silent in its action, having in one day of ten hours made complete 3000 lattices, including cutting off, rounding and punching. The lower portion of the jaw is cut away, as shown, for punching the flanges of I-beams up to 15 inches.

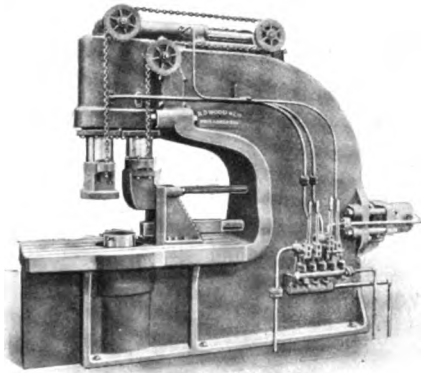
No.	Gap	Stroke of Vertical Rams	Combined Power of Two Vertical Rams	Code Words
1	3' 6"	24"	80 Tons	Modorraron
2	4 6	24	100 "	Modulamen
3	5	24	130 "	Mumbanda



HYDRAULIC SECTIONAL FLANGER.

THESE machines are made in the sizes given in above table (the gap being measured from the center line between the two vertical rams to the back of the jaw); all designed for working pressure of 1500 pounds per square inch.

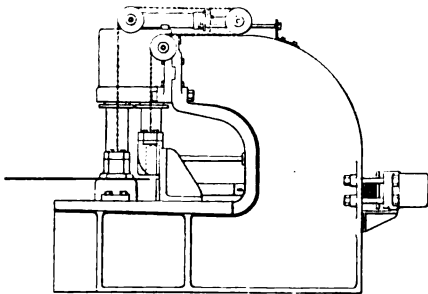
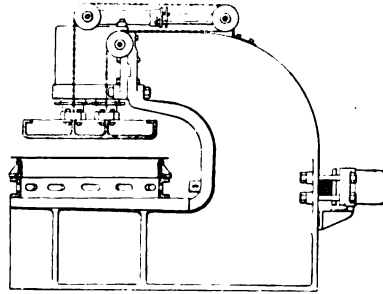
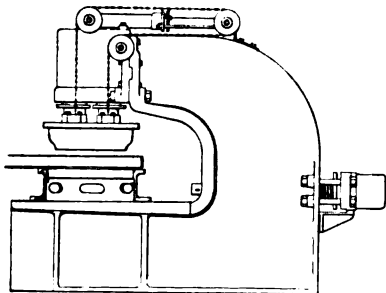
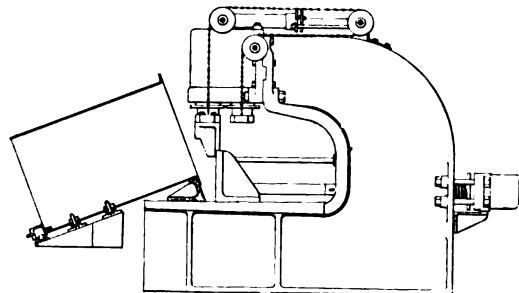
Except in shops where standard sizes of boiler fronts and of other work can be rigidly adhered to, enabling a reasonable number of dies to cover the range of work, it is preferable to install a machine which is adapted to any shape or dimension, and for which but few dies are required. Such a machine is illustrated on preceding page, and although it does its large work more slowly than the four-column press, yet on small work, for which whole dies can be carried, it is equally rapid. The outer vertical ram is used as a clamp, while the inner vertical

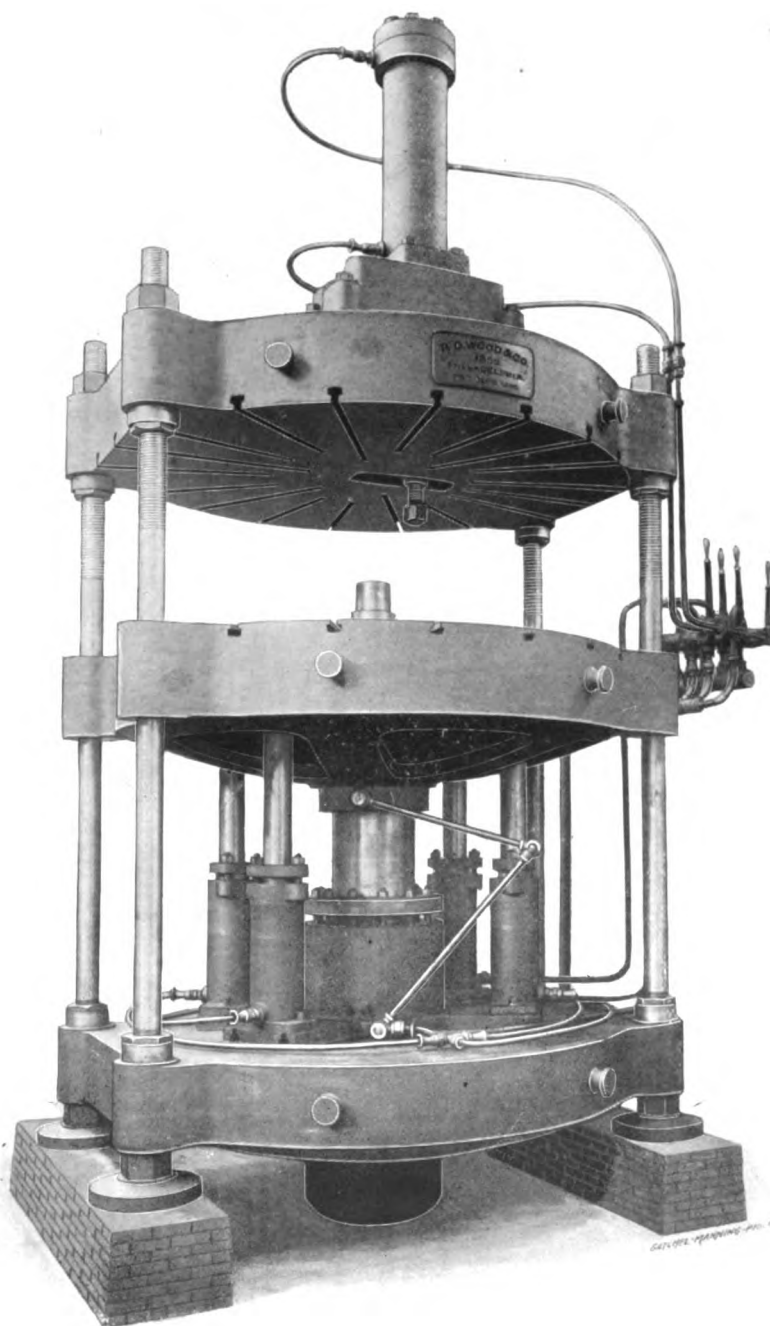


ram, having a plow-shaped die at its lower end, turns down from two to three feet of flange at one heat. The action of the horizontal ram follows the plow, and smooths and squares up the flanges around the die block upon which the plate is clamped. An interlocking device is used to prevent any possible foul between the plow and the horizontal ram.

When used on small heads, both of the vertical rams are attached to a male die, and the plate is clamped against the latter by a supplementary ram moving upwards from below. The supplementary ram is carried in a cylinder, hung in the lower jaw of the frame, and located centrally between the two upper rams. This operation is illustrated by the accompanying cut. It is also an exceedingly useful tool for upsetting and joggling work.

Below are given illustrations of a few of the operations which may be performed on this flanger:

**FLANGING LARGE HEAD SECTIONALLY.****FLANGING ENTIRE HEAD AT ONE OPERATION.****FLANGING FLUE HOLE.****FLANGING BOILER FLUE.**



FOUR-COLUMN FLANGING PRESS.

(Code Word, "Mogarino.")

560 tons capacity; 8' x 12' between columns; working pressure, 1500 pounds per square inch; with Patented Adjustable Overhead Cylinder; standard sizes for 6' and 8' boiler heads, larger sizes for special requirements.

FOUR-COLUMN FLANGING PRESS.

THIS press has all the improvements of its type, except that for locomotive work horizontal cylinders are sometimes secured to the moving platen for dressing up certain portions of the flanged sheet. It has seven cylinders, as follows: A main cylinder for operating the movable platen, its ram acting as the cylinder for an internal ram used for flanging fire doors, or as a clamp when small work is flanged; four jack or vise cylinders for clamping large work, and an overhead adjustable cylinder for turning out a furnace mouth at the same heat as the outer flange; as this latter cylinder is adjustable, it may be centered over the furnace mouth, which is usually located out of center of the boiler head, and thus permits the flanging of the latter to be done centrally on the moving platen—a feature of great importance—avoiding as it does excessive strains on the columns and main ram. For some classes of work the press is supplied only with the main and internal rams. See page 40. Flanging dies are not included.

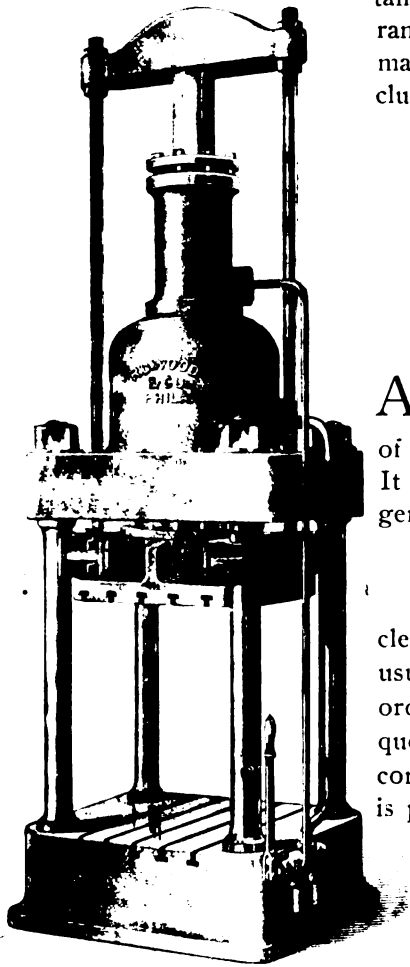
HYDRAULIC DIE PRESS.

(Code Word, "Mogliama.")

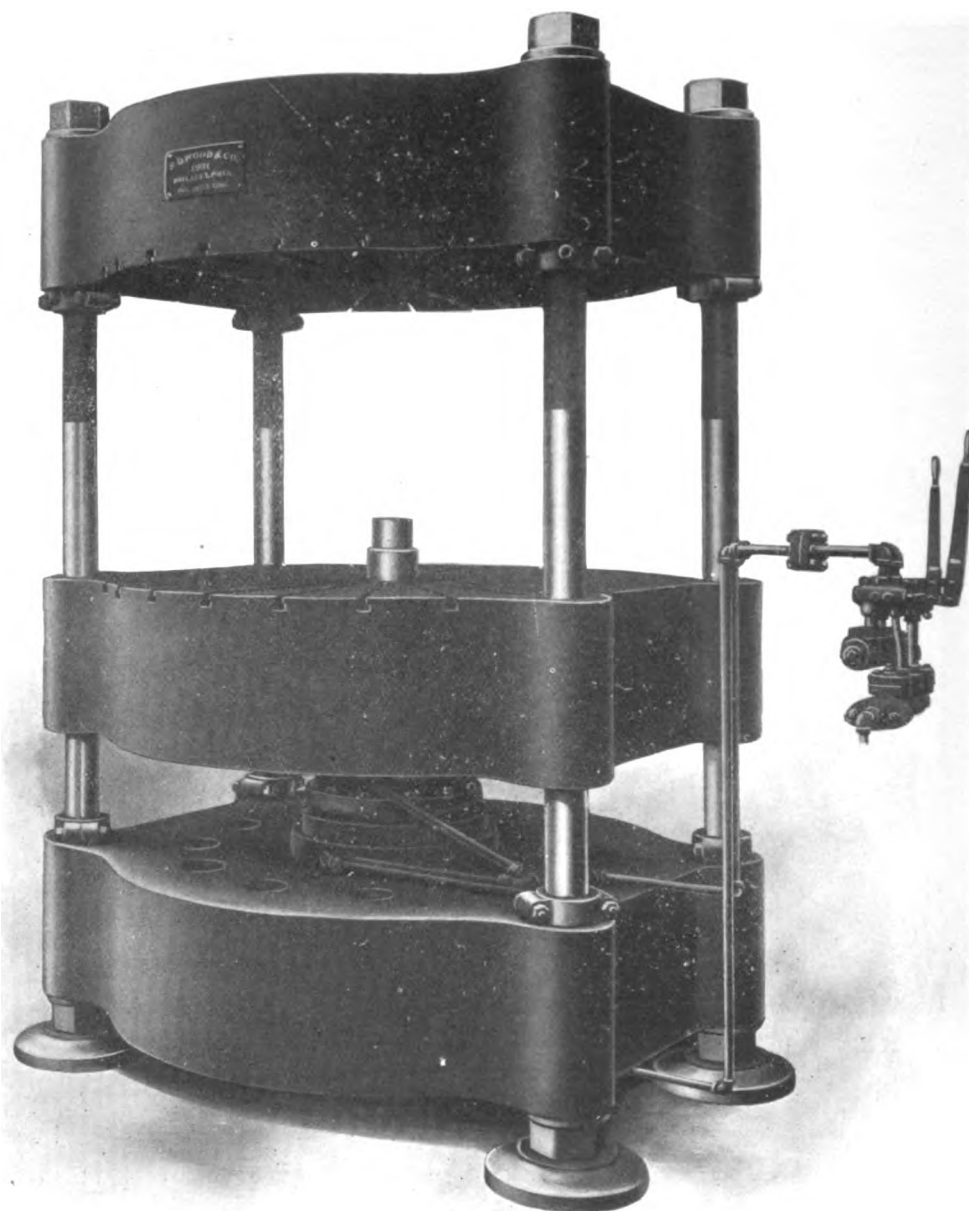
A SMALL machine adapted to ordinary die work, but without any of the special requirements for drawing or forging. The feature of this machine is its speedy action, especially in the return motion. It is solidly built of the finest material, and will be found a durable general utility machine.

Dimensions and power to suit requirements.

Economy of Power in Hydraulic Presses.—To afford clearance for dies and removal of finished material, hydraulic presses usually have long strokes, a small part only doing actual work. As ordinarily built, this means wasteful power consumption, not infrequently five to ten times as much as is used effectively. To overcome this, we design, when requested, presses so that their idle stroke is performed by a separate small cylinder, allowing the main cylinder to fill automatically from an overhead tank. Where low-pressure water (say 300 to 500 pounds) is available, the supplementary cylinder and tank is dispensed with. The maximum power becomes effective when the die reaches its work. This economizes pump and accumulator power, and reduces the cost of operation.



HYDRAULIC DIE PRESS.



FOUR-COLUMN FLANGING PRESS.

(Code Word, "Titerista.")

THIS press is of similar design to that illustrated on page 38, except that it has only the main ram and the internal clamping ram. Made in a variety of sizes and capacities. Designed for working pressure of 1500 pounds per square inch.

HYDRAULIC PRESS

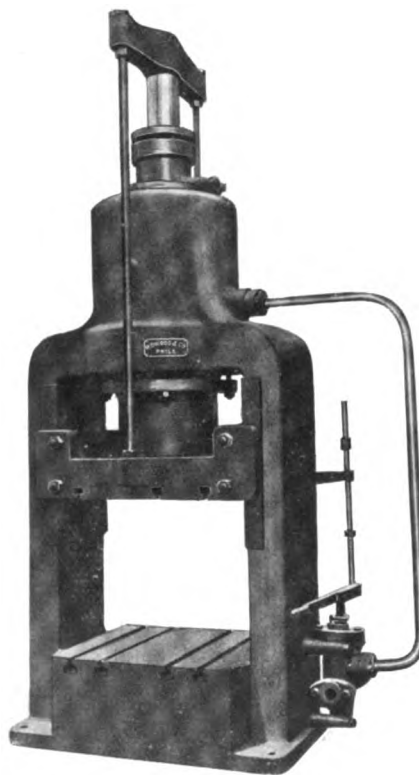
FOR GENERAL SERVICE.

(Code Word, "Titimaglio.")

THIS press is designed to operate from a base pressure of 500 pounds per square inch. The ram is guided for accurate die work. The main frame is made of a single casting, and the ram is well guided therein, being of the slide-block type. The stroke is adjustable.

Speed of Presses.—Hydraulic presses are now worked at great speed, sometimes up to 50 or 60 strokes per minute for forging purposes—and with much greater penetration than can be effected by a steam hammer, on account of the pressure being sustained instead of merely momentary.

Steam Intensifier.—It is also sometimes desirable to operate through the medium of a steam intensifier in the case of small presses and thus avoid pumping. Although this method is somewhat extravagant in steam consumption it permits of the maximum working speed and is in use on several very large forging presses.

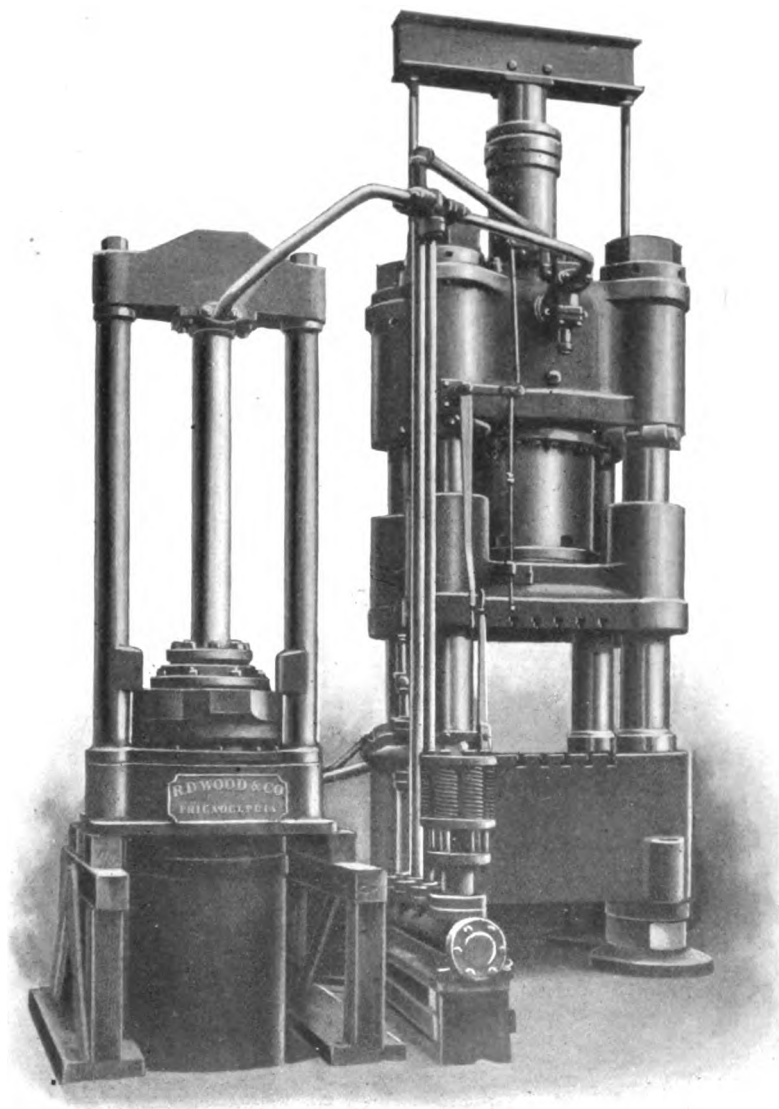


STANDARD TRIPLE POWER CYLINDERS.

For 1500 pounds per square inch pressure. As used on our hydraulic riveters.

Maximum	Intermediate	Minimum	Code Words
50 Tons*	35 Tons*	15 Tons*	Moedagem
60 "	40 "	20 "	Moerbezie
75 "	50 "	25 "	Mofarras
100 "	67 "	33 "	Mofetten
150 "	100 "	50 "	Mofletudo
180 "	120 "	60 "	Mogangas

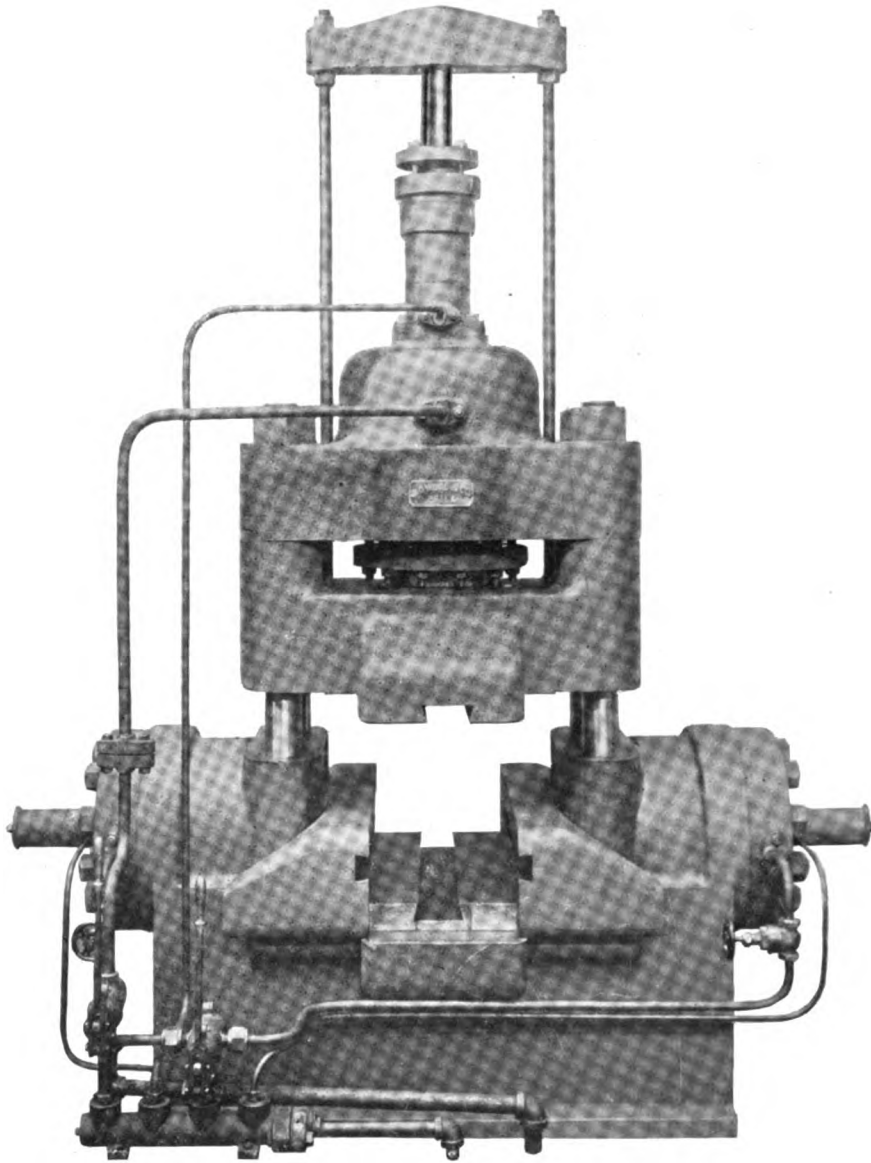
* 2000 pounds.



QUADRUPLE POWER HYDRAULIC FORGING PRESS.

(Code Word, "Titolarono.")

THIS illustration shows a heavy multiple power hydraulic forging equipment for general use and die work. The base pressure brings the moving platen down on the work; the intensifier is then operated to complete the stroke. The arrangement shown gives a range of four pressures on the work. The stroke is adjustable. Designs for any desired capacity.

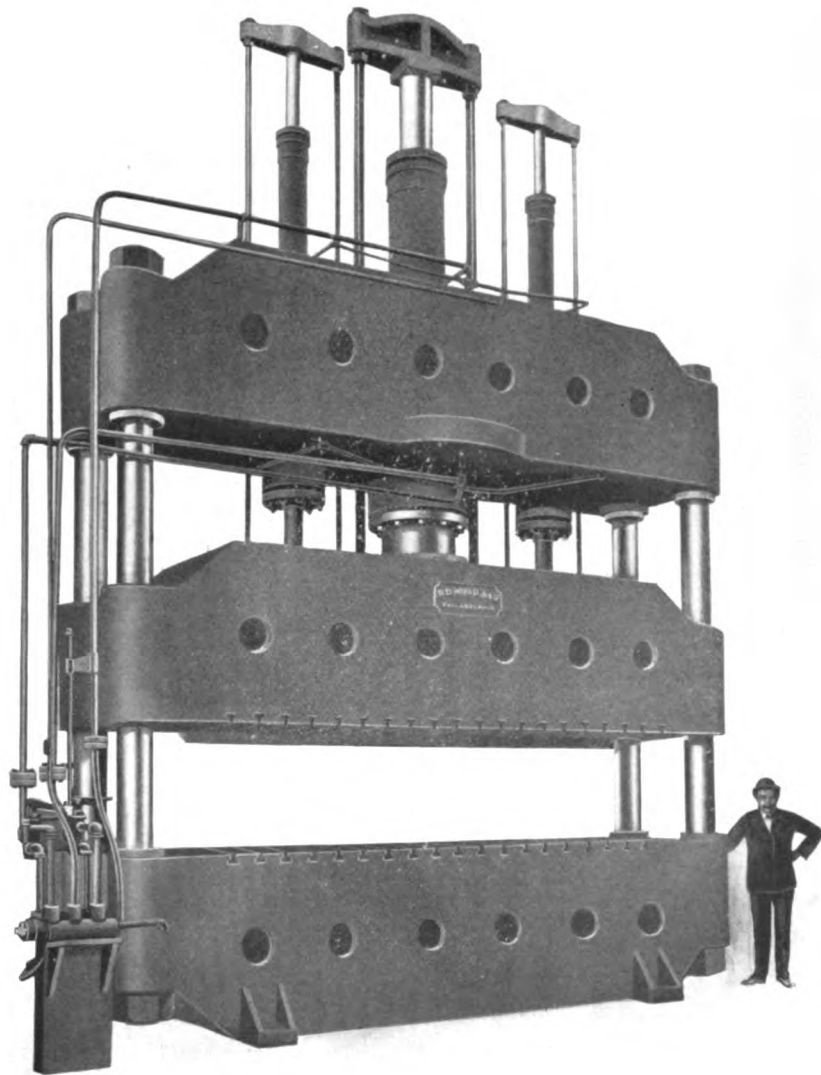


HYDRAULIC FORMING PRESS.

THREE CYLINDER TYPE.
(Code Word, "Multanda")

Each cylinder 100 tons capacity; working pressure, 1500 pounds per square inch.

DESIGNED for bending and forming rail chairs, frog plates, switches, etc.; for steam and street railways. It is obvious, however, that it is applicable to many other kinds of work. The cylinders are independent of each other, and any of them may be used as clamping or bending and forming rams. The horizontal rams may be arranged to act in exact unison or one at a time.

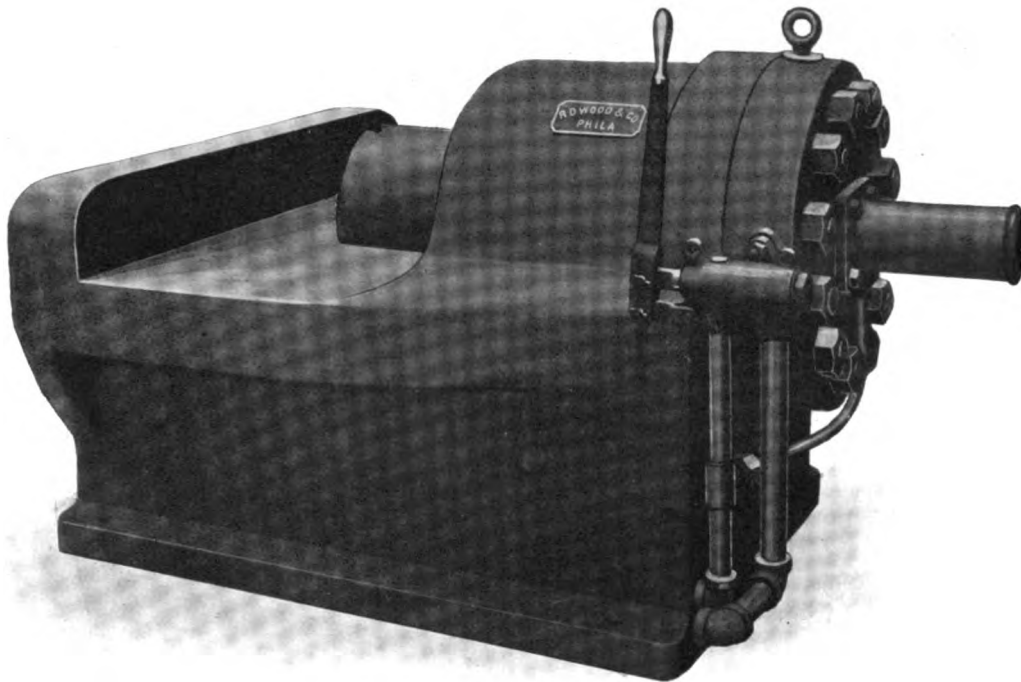


HYDRAULIC FLANGING AND COLD PLATE BENDING PRESS.

(Code word, "Toccalapis.")

Working pressure, 1500 pounds.

THIS press is specially designed for bending cold steel plate as required in shipyards, pressed steel car works, etc. It is also very serviceable for special flanging, forming and bending work. It is provided with a clamping bar of liberal capacity actuated by two independent hydraulic cylinders.

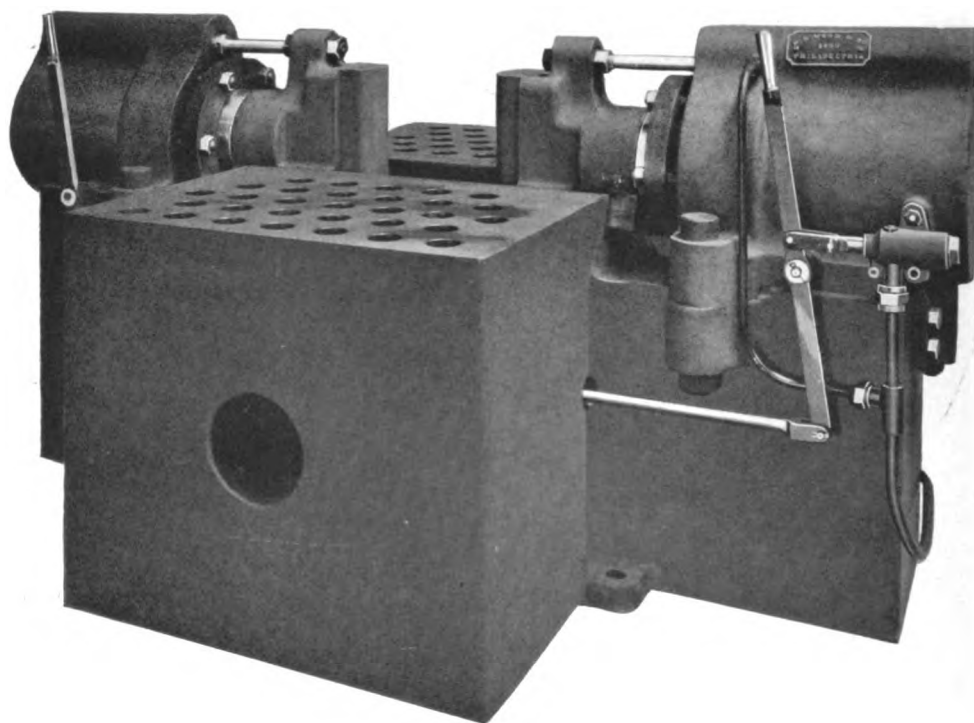


HYDRAULIC BENDING PRESS OR BULLDOZER.

(Code Word, "Tocharon.")

Working pressure, 1500 pounds per square inch.

THIS illustration is of a type of Bending Press, which has the merit of acting upon the piece to be bent in a direct line with the center of the forcing ram. The cylinder is part of the table and set well back with a long stroke. This machine can also be advantageously used as a straightening press, the blocks being adjustable to any desired distance between centers within the length of the table. Dimensions to suit purchasers.



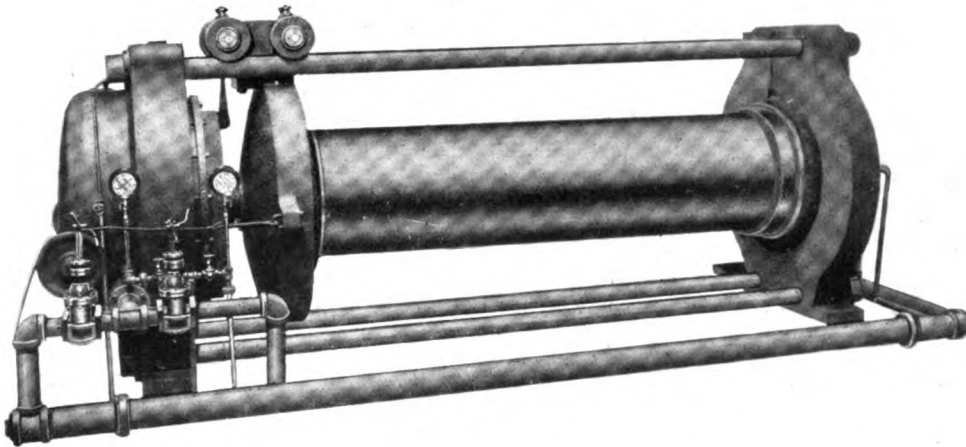
DOUBLE HYDRAULIC BENDING OR STRAIGHTENING PRESS.

(Code Word, "Mundnovl.")

Capacity, 10" channels ; stroke, 12" ; working pressure, 1500 pounds per square inch ; table, 5' by 3'.

A MOST effective machine of its type, for, as it often occurs in practice, a beam is bent a little too much, and with this double-cylinder arrangement the error can be corrected by using the idle cylinder without moving the beam.

Either cylinder may be operated from either side of the Press, independently or in unison. We make larger sizes of this machine where required.

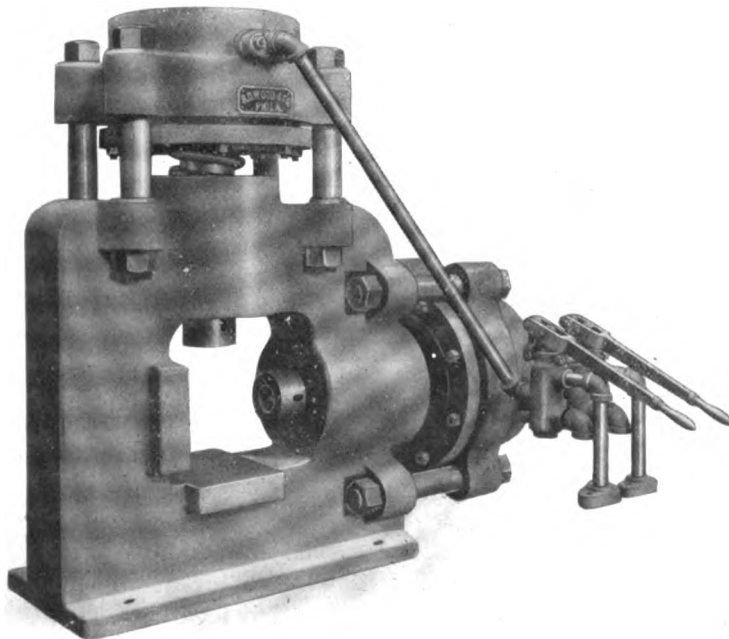


HYDRAULIC PIPE-TESTING PRESS.

(Code Word, "Muserule.")

FOR testing 60" diameter pipe up to 300 pounds pressure per square inch, or small size pipe to correspondingly higher pressures. It is so arranged that the clamping cylinder and pipe can be filled with water at a low pressure; the higher pressure being then used as required.

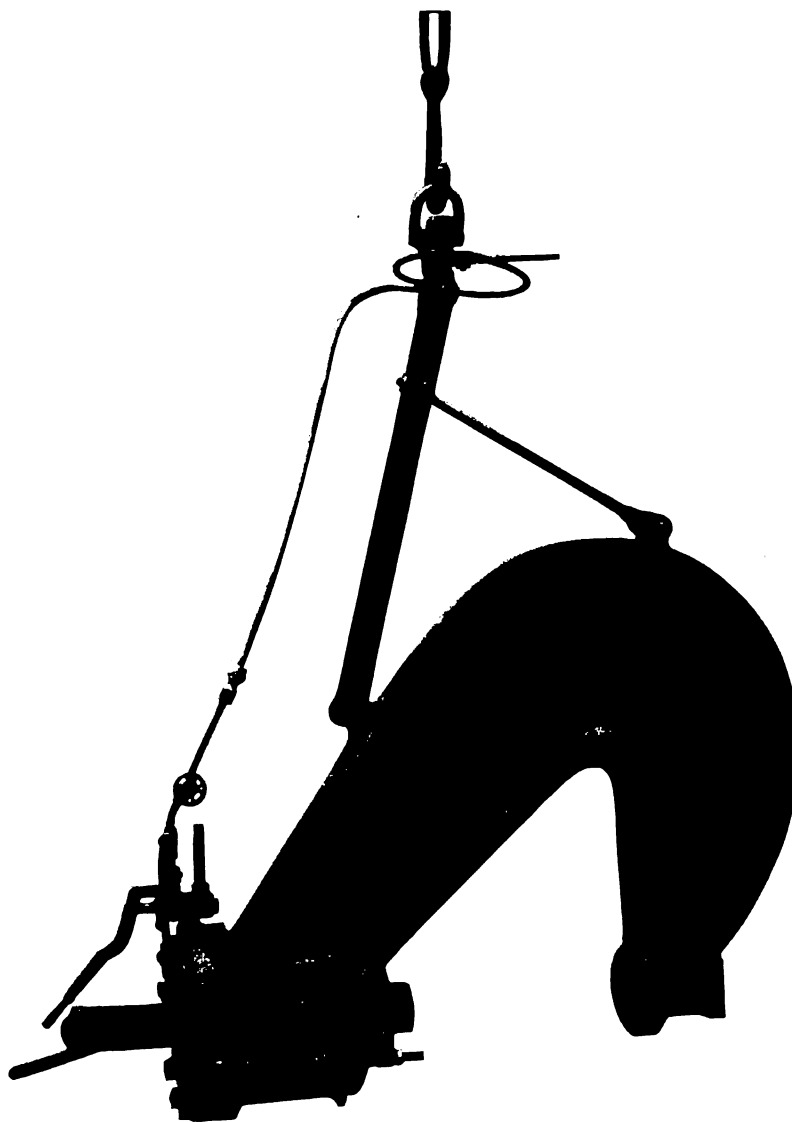
Furnished with intensifier for special requirements.



SPRING BANDING PRESS.

(Code Word, "Tochedad.")

FOR banding laminated springs for car and locomotive trucks. Cylinders may be operated in unison or independently.



PORTABLE HYDRAULIC CRANK PIN PRESS.

FOR LOCOMOTIVE WORK.

(Code Word, "Munequeria.")

125 tons capacity; 28" gap; working pressure, 1500 pounds per square inch.

THE press here illustrated has a large field of usefulness beyond that of pressing in or removing crank pins. It is equipped with an operating valve for use when connected to the regular pressure main, and a hand pump for use in isolated locations where connection to the pressure main cannot be made.

MULTIPLE POWER HYDRAULIC INTENSIFIERS.

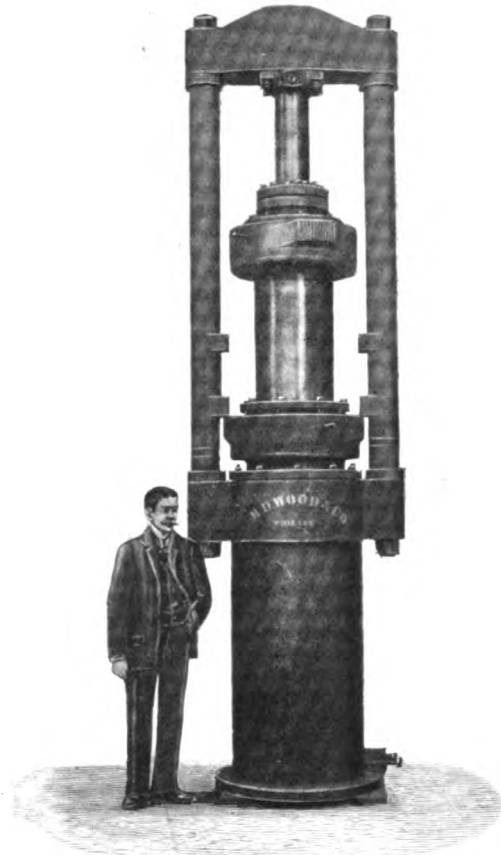
Shem's Patent.



DOUBLE POWER INTENSIFIER.

(Code Word, "Munerabo.")

For raising from 400 pounds to 750 or 1200 pounds pressure per square inch; rams, 15½", 22" and 28" diameter by 6' stroke.



TRIPLE POWER INTENSIFIER.

(Code Word, "Mohatrones.")

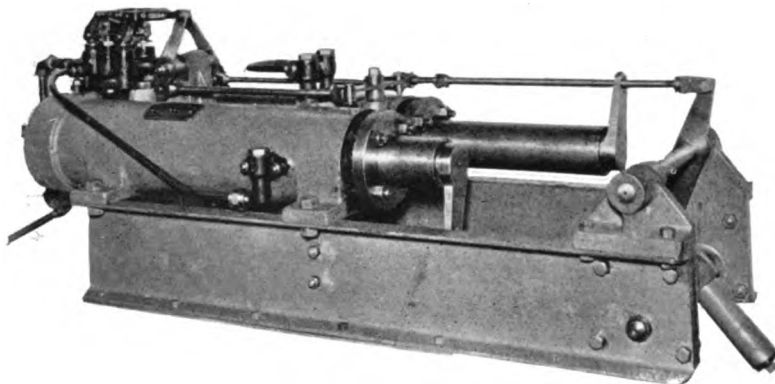
For raising from 500 pounds to either 1000, 2000 or 3000 pounds pressure per square inch; rams, 8", 12", 17" and 20" diameter by 5' stroke.

THESE machines are built of either double, triple or quadruple power, and for any service, capacity and pressure, the change from one pressure to another being made in a few seconds.

The various types of single power intensifiers which we build are shown on the next page.

The automatic intensifier acts continuously like a pump.

SINGLE POWER HYDRAULIC INTENSIFIERS.



CONTINUOUS ACTING AUTOMATIC INTENSIFIER.

(Code Word, "Moinillon.")

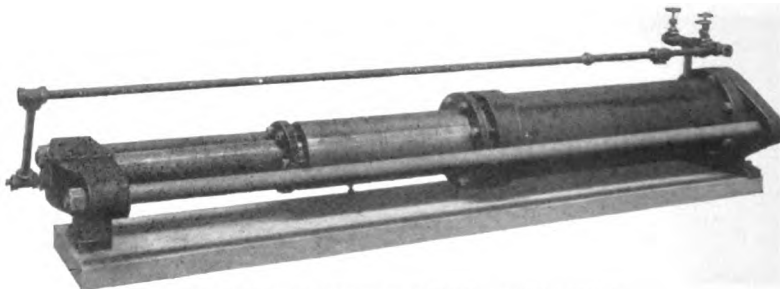
6" rams; 24" stroke; for raising pressure from 750 to 1500 pounds per square inch.

SINGLE POWER INTENSIFIER.
(Code Word, "Moharilla.")

Without pushback; 16" and 33' rams; 6' stroke; for raising pressure from 375 to 1500 pounds per square inch.

SINGLE POWER INTENSIFIER.
(Code Word, "Mohiento.")

Inside packed, with pushback, for raising pressure from 1500 to 2000 pounds per square inch.



HORIZONTAL SINGLE POWER INTENSIFIER.

(Code Word, "Moinante.")

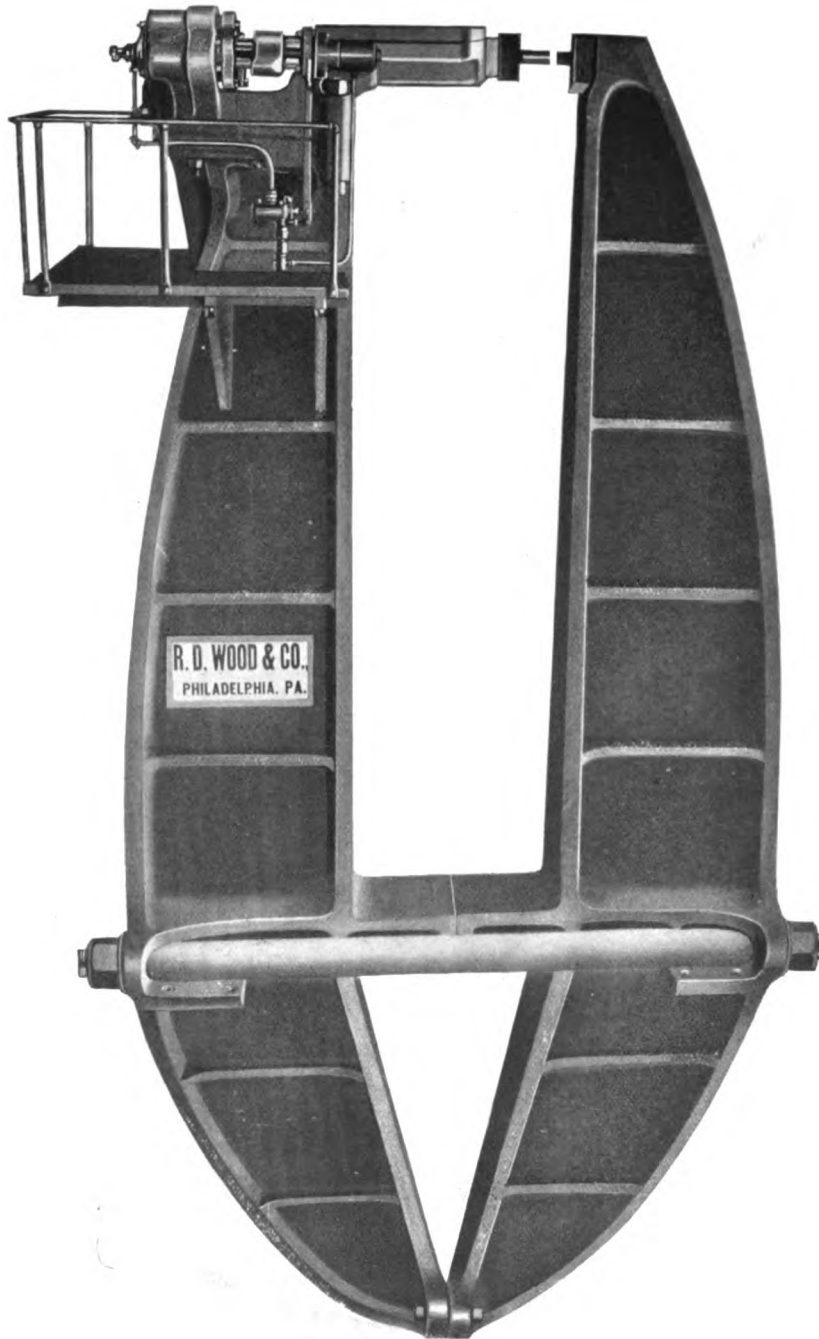
For raising pressure from 300 to 750 pounds per square inch.

THESE machines can be built for use in horizontal position, which is of some advantage in cases where the rams are light and of long stroke.

HYDRAULIC DIMINISHER.

(Code Word, "Moirlung.")

THESE machines may also be adapted to the reverse service; that is, having available high pressure, 1500 pounds per square inch from accumulator, for instance, to secure say 750 pounds or other lower pressure in proportionately greater volume for some special duty.

HYDRAULIC FIXED RIVETER.

17' gap ; with Vauclain's patented overhanging cylinders and ram, flush top and bottom, so that fire box may be swung above or below the ram.

33, 67 and 100 tons capacity. (Code Word, "Togatulus.")
 40, 85 and 125 " " { " " "Togulam." }
 50, 100 and 150 " " { " " "Toldadura." }

TRIPLE POWER OUTSIDE PACKED RAMS.

HYDRAULIC FIXED RIVETER.



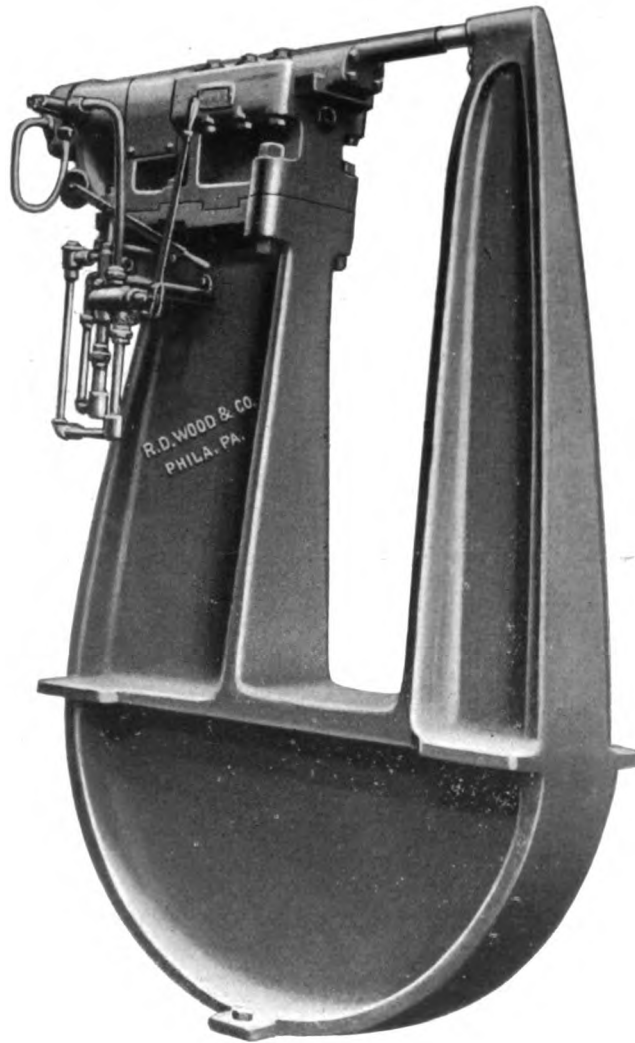
TRIPLE POWER HYDRAULIC RIVETER.

35, 65 and 100 tons capacity. (Code Word, "**Mungoado.**")
50, 75 and 125 tons capacity. (" " "**Muscosity.**")

12' gap ; working pressure, 1500 pounds per square inch ; with Vauclain's patented overhanging cylinder and Graves' patented squaring device ; housing made of a single steel casting.

THE riveters illustrated on this and the preceding page are designed especially for riveting locomotive boilers, the width between the stakes being great enough to permit the fire box to be swung between them. The cylinders are made flush on the under side. We also make them flush on both top and bottom, large square die-holders being secured to the end of ram and top of back stake, with holes for dies located in each corner. This construction is useful for getting at certain rivets in some styles of boilers.

The packings are readily accessible; removing the cylinder cap exposes them to view.

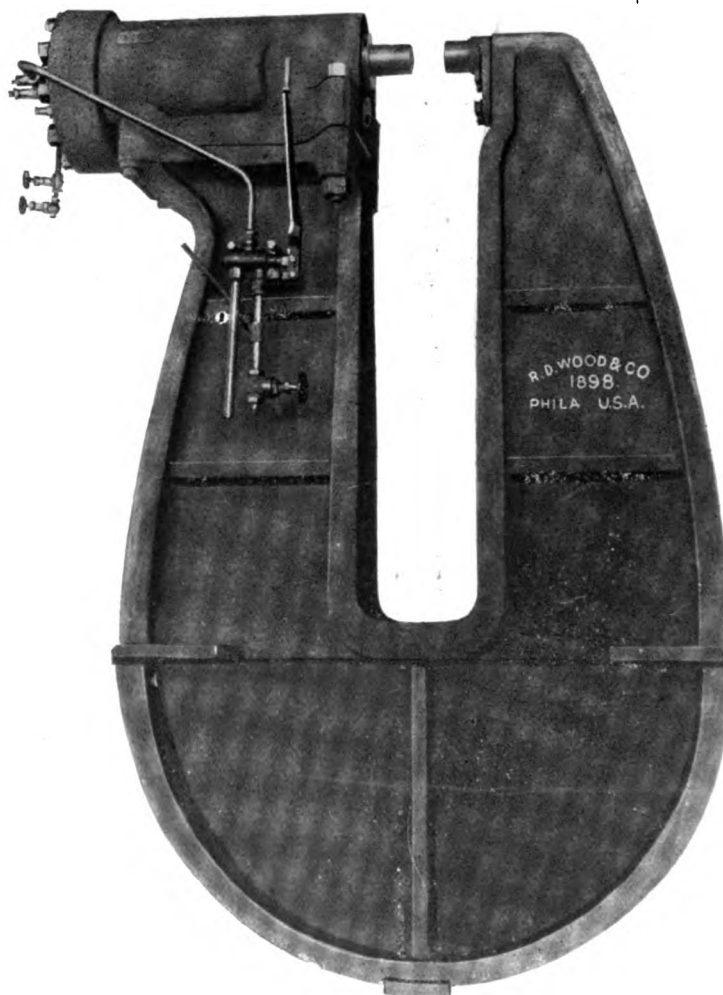
HYDRAULIC FIXED RIVETER.**TRIPLE-POWER OUTSIDE PACKED RAMS.**(Code Word, "**Tolladores.**")

Working pressure, 1500 pounds.

DESIGNED for general boiler shop use where the water or fluid used is not returned to the system and is consequently liable to contain grit and scale injurious to the rams. A shield of sheet steel is neatly fitted over the stuffing boxes and exposed rams to prevent scale and grit from settling thereon. Made with any desired gap and pressures.

For standard triple-power cylinders, see pages 41 and 57.
For gap and capacity code words, see pages 89-91.

HYDRAULIC FIXED RIVETER.



TRIPLE POWER HYDRAULIC RIVETER.

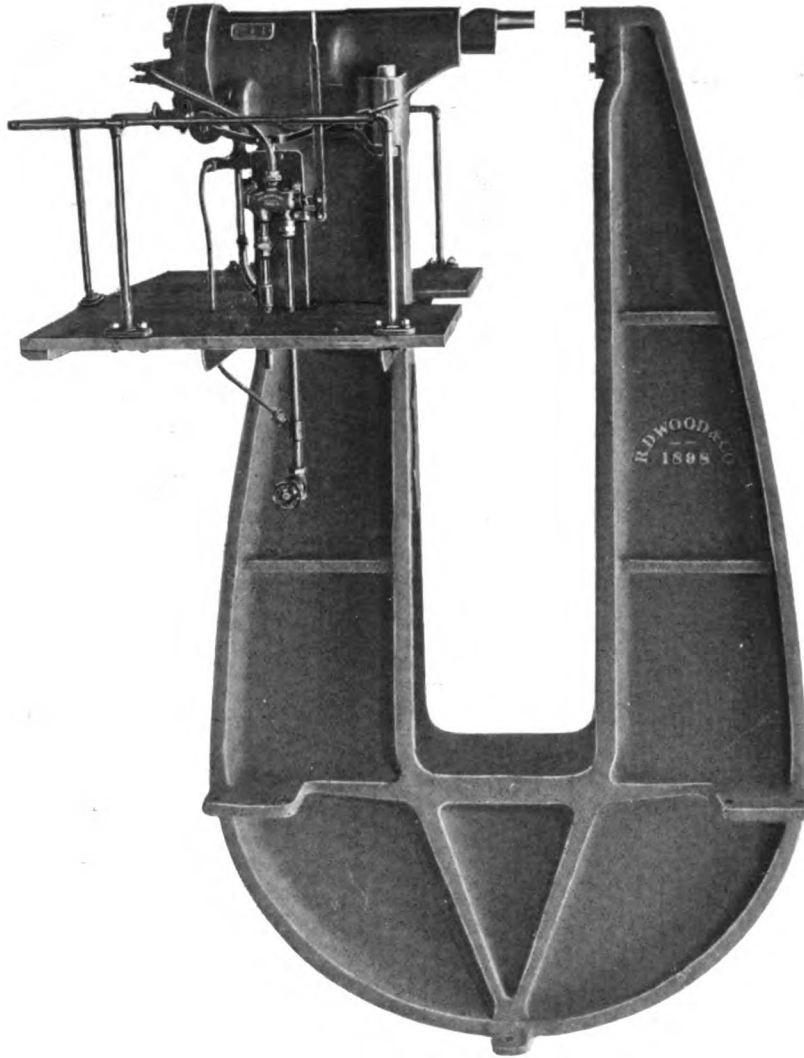
(Code Word, "Munlarum.")

8' gap; capacity, 50, 100 and 150 tons; working pressure, 1500 pounds per square inch.

DESIGNED for riveting marine boilers. The cylinders are flax-packed, and the packing is adjustable from the outside. The housing is made from a single steel casting.

For standard triple-power cylinders, see pages 41 and 57.
For gap and capacity code words, see pages 84-91.

HYDRAULIC FIXED RIVETER.



TRIPLE POWER HYDRAULIC RIVETER.

(Code Word, "**Munifliche.**")

10' 6" gap ; 25, 50 and 75 tons capacity ; working pressure, 1500 pounds per square inch.

FOR general boiler shop use; the housing being made of a single steel casting. It is equipped with operating platform and a valve for operating a tower crane. The packings are readily accessible; removing the cylinder cap exposes them to view.

For standard triple-power cylinders, see pages 41 and 57.
For gap and capacity code words, see pages 89-91.

Without Patent Automatic Squaring Device.	(Code Word, *** Mojoneros.)
With " " " " " "	(" " " " Molagem.)

THESE
cylinders
in table
tention is
adapted to
mum econ
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originated
tool for g
can
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any
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with

40, 50, 70

The single power riveter is, of course, the proper tool where the work is practically uniform; but in shops where there is any considerable range of work to be done on one machine, the triple power type will prove by far the most economical tool, and costs but slightly more. It will be noted that the frame of this riveter is a steel casting in one piece, with the cylinder bolted on, forming the simplest and cheapest construction. On the next page we illustrate an older design with cast iron housing and steel stake

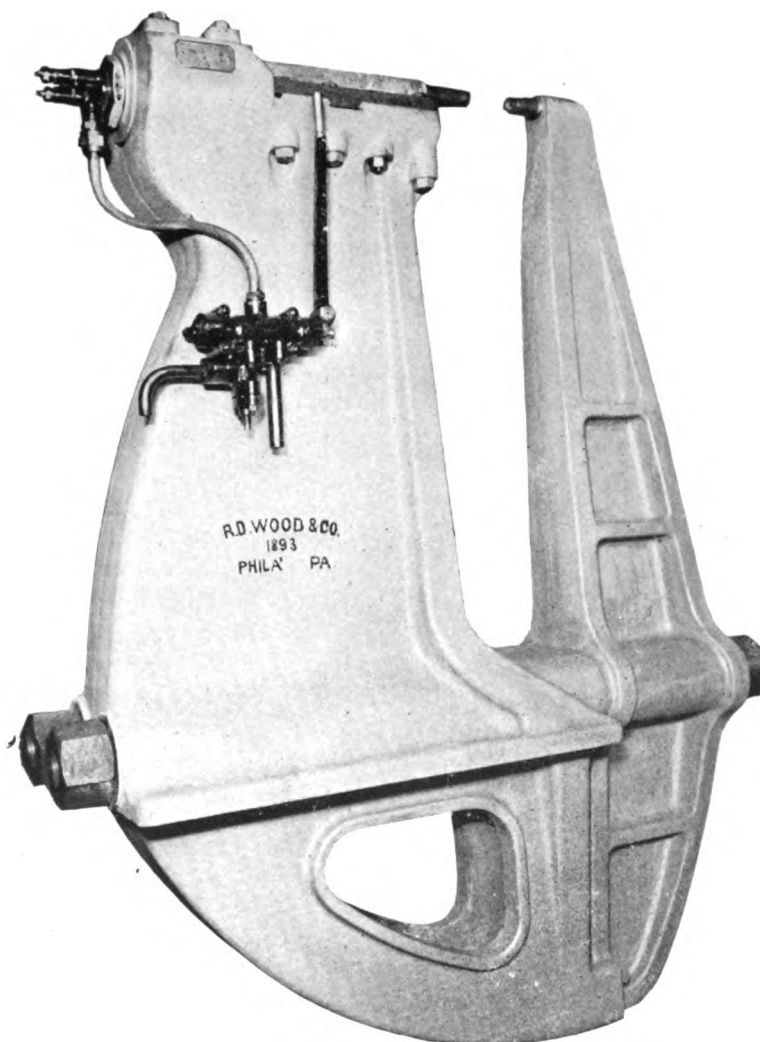
Deeper gaps to order.

No.	1—50,	35 or 15	tons	power	5',	6',	7',	8',	9'6",	10'6",	and	12' gaps.
"	2—60,	40 "	20	"	5',	6',	7',	8',	9'6",	10'6",	"	12' "
"	3—75,	50 "	25	"	"	"	"	"	"	"	"	17' "
"	4—100,	67 "	33	"	"	"	"	10'6",	"	12' "	"	17' "
"	5—150,	100 "	50	"	"	"	"	10'6",	"	12' "	"	17' "
"	6—180,	120 "	60	"	"	"	"	10'6",	"	12' "	"	17' "

• For standard triple-power cylinders, see pages 41 and 57.
For gap and capacity code words, see pages 89-91.

bolted together; a construction still preferred in some instances as possibly more rigid, though somewhat more costly. For Tower Cranes, see pages 71-73.

HYDRAULIC FIXED RIVETER.



TRIPLE POWER RIVETER, WITH CAST IRON HOUSING.

(Code Word, "Molclamo.")

For standard triple power cylinders, see pages 41 and 57.
For gap and capacity code words, see pages 89-91.

HYDRAULIC LIFTING RIVETER.

(Code Word, "Mojigato.")

Hughes' Patent.

FOR BRIDGE SHOPS.

STANDARD SIZES.

150, 100 or 75 tons capacity, single or triple power, 6' and 8' working gap.

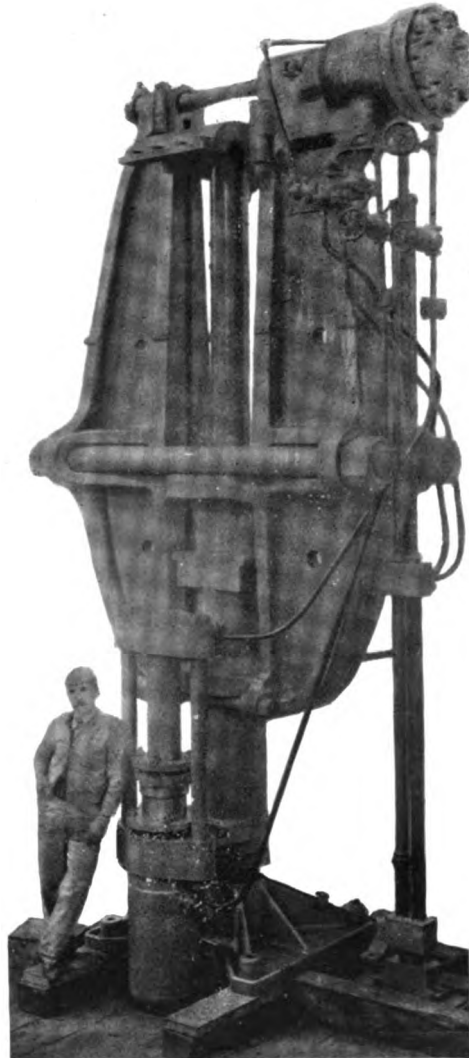
For Standard Triple Power Cylinders, see page 57.

Working pressure, 1500 pounds per square inch.

THE lifting riveter with intensifier here illustrated was built for the bridge shop of a prominent steel works near Philadelphia, and, as installed, stands upon suitable foundations in a pit, so that when lowered as shown the cylinder is brought down conveniently close to the shop floor, to admit of riveting bottom chords as girders are passed along through the machine, which rises for vertical seams and top horizontal rows. In this instance the works-pressure of about 500 pounds per square inch is utilized in the lifting cylinder, while by means of the intensifier it is increased to 1500 pounds for the riveter proper. The operator is carried with the machine, and from his platform controls the tool. The back die of the riveter is arranged with a quick thread for withdrawal to clear braces.

In heavy suspended work the lifting motion supplements the traveling crane, in that the former is much more sensitive in adjustment for vertical seams, and allows work to be done with the least possible head room, as it does not have to be lifted over the machine.

Tower Cranes, see pages 71-73.



* For gap and capacity code words, see pages 89-91.

SHIP RIVETING.

WHILE ship riveting by machinery has so far received comparatively little attention in the United States, we have given the subject careful study, and offer tools, etc., covering the most advanced development of this special class of hydraulic appliances. Marked economies are secured. Inquiries from ship-builders are solicited.

HYDRAULIC PORTABLE RIVETER.

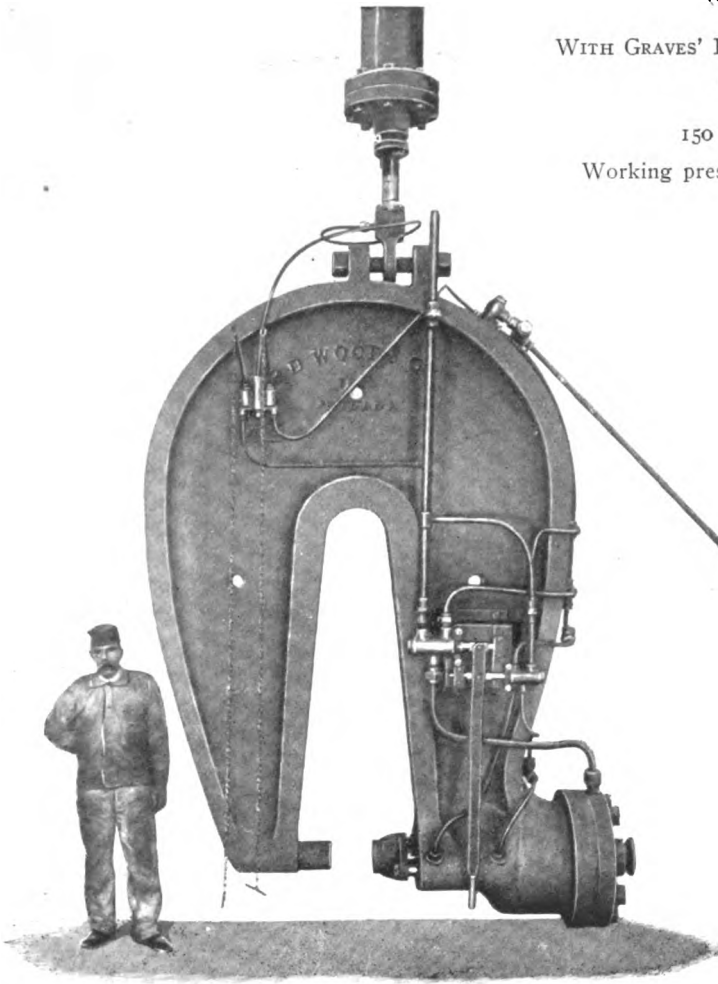
(Code Word, *'Molduraba.'')

WITH GRAVES' PATENT AUTOMATIC SQUARING DEVICE.

(Code Word, *'Molecule.'')

150 tons single power; 5' gap.

Working pressure, 2000 pounds per square inch.



A LARGE portable riveter, for extra heavy tank work. As shown, it is carried by a portable hydraulic lift (see page 67), having its valve attached to the riveter, and by means of which the latter is readily adjusted vertically to its work.

Automatic Squaring Device.—It is often desirable, on account of the weight of this machine, and the heavy class of work for which it is used, to have some mechanical means of bringing the dies square and central over the rivet, and this is accomplished by an automatic squaring device, which goes forward in advance of the die, acting also as a partial plate closer, and forcing the rivet firmly home before upsetting it.

* For sizes, use Code, pages 89-91.

HYDRAULIC PORTABLE RIVETERS.

Working pressure, 1500 pounds per square inch.

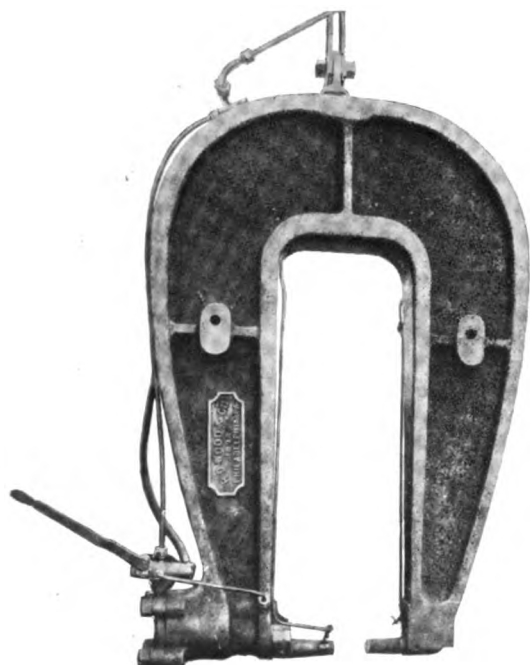
*Standard Sizes.

SINGLE POWER.

75 tons power.....	72", 66", 60", 54", 48", 36", 24" gap.
60 " "	72", 66", 60", 54", 48", 36", 24" "
45 " "	72", 66", 60", 54", 48", 36", 24" "
35 " "	72", 66", 60", 54", 48", 36", 24" "
25 " "	60", 54", 48", 36", 24", 12" "
15 " "	48", 36", 24", 12" "

Longer or shorter gaps to order.

Any special requirements as to *width* of gap should be specified.



HYDRAULIC PORTABLE RIVETER.

(Code Word, *** *Moledero*.)

35 tons; 6' gap.

OUR line of portable hydraulic riveters embodies in the designs the combination of lightness and strength to the greatest possible extent. In each instance the most effective distribution of metal has been carefully studied to secure a portable tool of minimum weight, without sacrifice of strength and rigidity. The frames are of cast steel, the cylinders bronze lined, and the machines may hang in a vertical or horizontal position by swinging or changing over the arms. A coil of flexible copper piping, as shown on following page, can be supplied as an extra when desired. Attention is also called to the hydraulic lifts for large portable riveters, shown on page 67.

* For sizes, etc., use Code, pages 85-91.

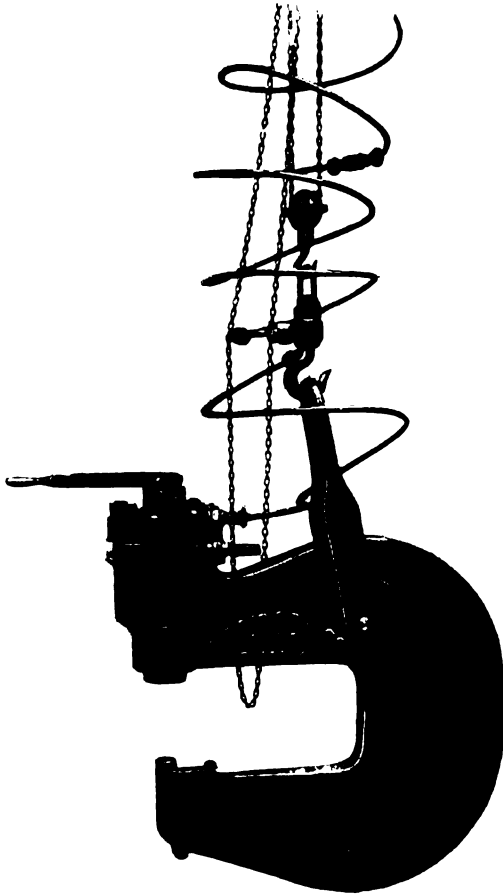


HYDRAULIC PORTABLE RIVETER.

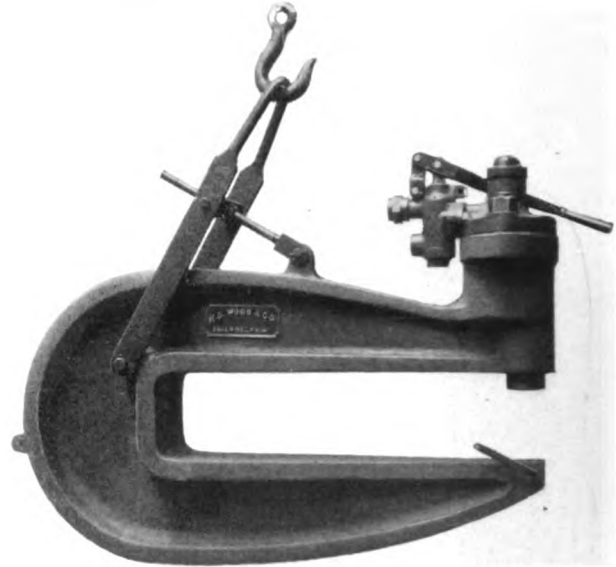
(Code Word, *** *Molenda*.)

45 tons; 4' 6" gap.

HYDRAULIC PORTABLE RIVETERS.



HYDRAULIC PORTABLE RIVETER.
WITHOUT FLEXIBLE COPPER PIPE.
(Code Word, *** *Molinismo.* **)
45 tons; 24" gap.



HYDRAULIC PORTABLE RIVETER.
WITH ADJUSTABLE HANGER.
(Code Word, *** *Mollmus.* **)
15 tons; 36" gap.



HYDRAULIC PORTABLE
RIVETER.
(Code Word, *** *Munirent.* **)
15 tons; 48" gap; with adjustable
hanger.

THESE tools work with great rapidity. For instance, one of our 15-ton machines has driven 6000 $\frac{3}{8}$ " cold rivets in ten hours, which evidences their lightness and portability. They are strongly built; may be relied upon for effective service. For Lifts and Bracket Cranes, see pages 67-69.

* For sizes, use Code, pages 89-91.

HYDRAULIC PORTABLE RIVETERS.

HINGED AND PARALLEL TYPES.

See also pages 64 and 70.

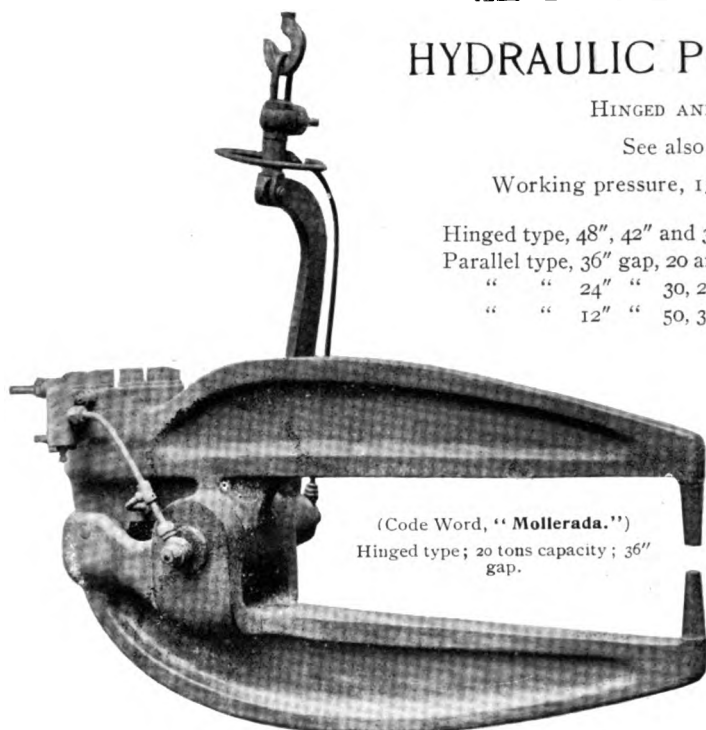
Working pressure, 1500 pounds per square inch.

Hinged type, 48", 42" and 36" gap. Capacities, 50, 30, 20 and 15 tons.

Parallel type, 36" gap, 20 and 15 tons capacity.

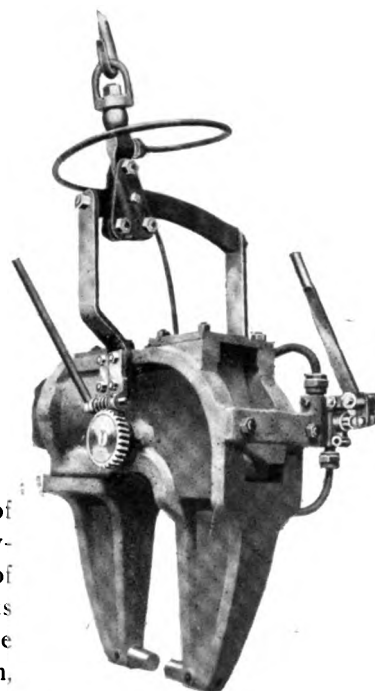
" " 24" " 30, 20 and 15 tons capacity.

" " 12" " 50, 30, 20 and 15 tons capacity.



(Code Word, "Mollerada.")
Hinged type; 20 tons capacity; 36"
gap.

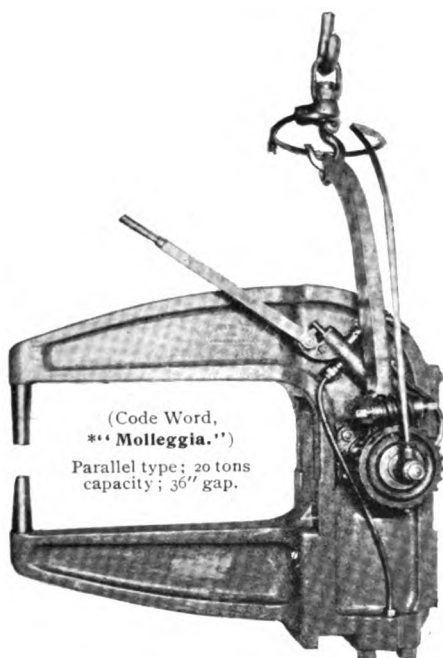
HYDRAULIC PORTABLE RIVETER.



HYDRAULIC PORTABLE RIVETER.

(Code Word, "Munitabat.")

Parallel type; 30 tons capacity; 21" gap;
with special hanging gear.



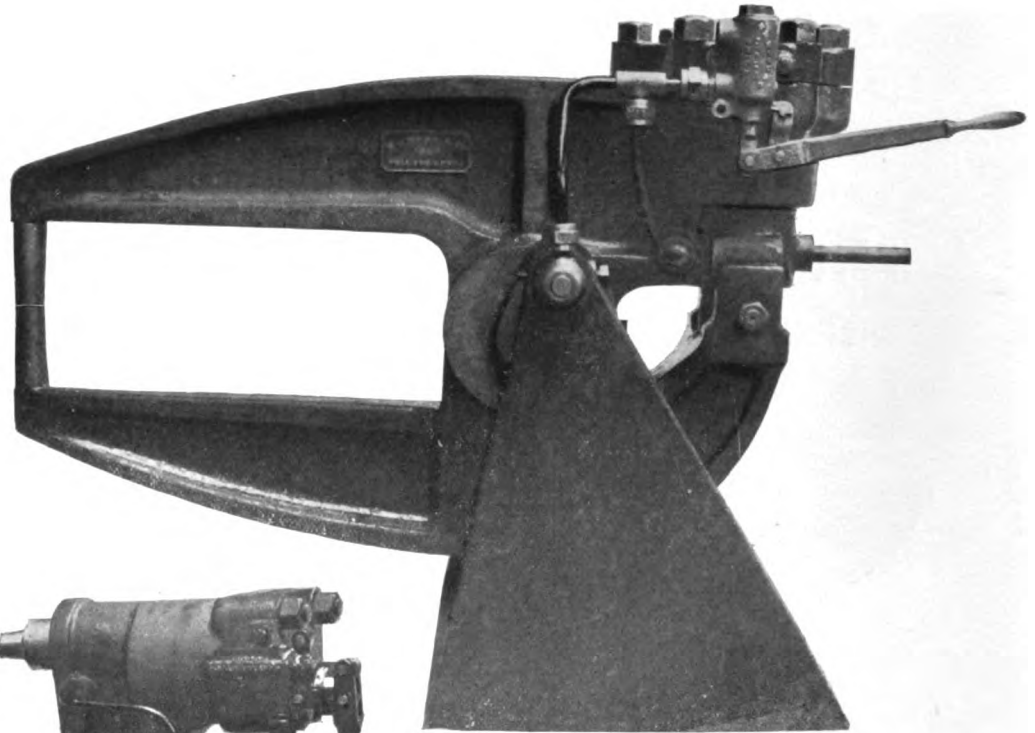
(Code Word,
"Molleggia.")
Parallel type; 20 tons
capacity; 36" gap.

HYDRAULIC PORTABLE RIVETER.

THESE machines are of special utility for riveting in places difficult of access. A tool with its cylinder over the die, while less costly, requires room, and therefore in some classes of work could not be used. The hinged and parallel types are frequently selected for general work, as they cover a wider range, and it will be noted that the former are not made of less, or the latter more, than 36" gap. The effect of the arc in the hinged machine becomes objectionable on short gaps. This is obviated in the parallel type, a design not adapted to long gaps. In addition to the swivel by which these machines are suspended, they are provided with hangers and worm gear, permitting them to hang in any position in one plane.

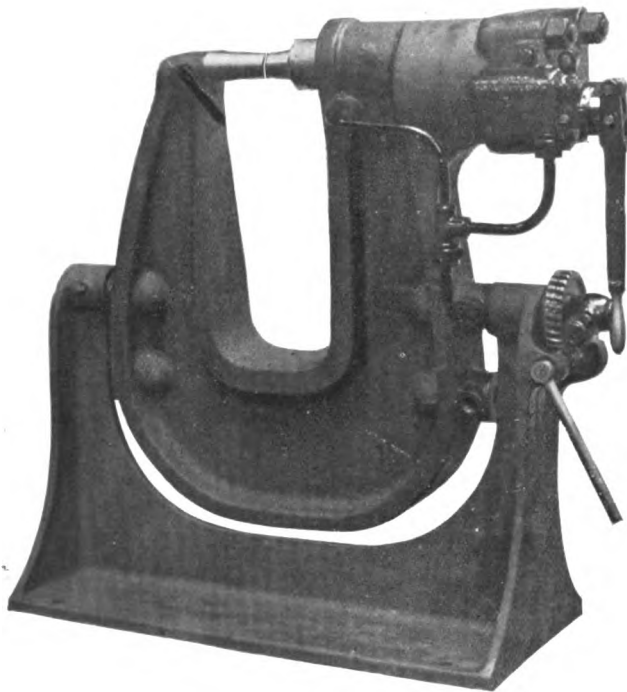
* For sizes, use Code, pages 85-91.

HYDRAULIC RIVETERS.



SPECIAL RIVETER.
(Code Word, **"Munitanda."*)

25 tons ; 30" gap ; hinged type ; with trunnion mounting.



BEAR TYPE RIVETER.
(Code Word, **"Munonera."*)

25 tons ; 24" gap ; with special worm gear mounting.

* For sizes, use Code, pages 85-91.

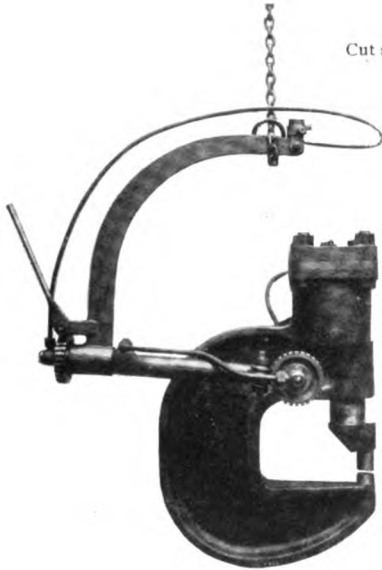
THESE riveters are designed with their special mountings for driving every rivet in steel car trucks. The trucks are swung over the riveters by a jib crane, each riveter driving certain rivets.

HYDRAULIC PORTABLE RIVETERS.

WITH COMPOUND HANGING GEAR.

(Code Word, *'Mollotors.'')

Cut shows lower end of Hydraulic Lift. (See pages 60, 67.)

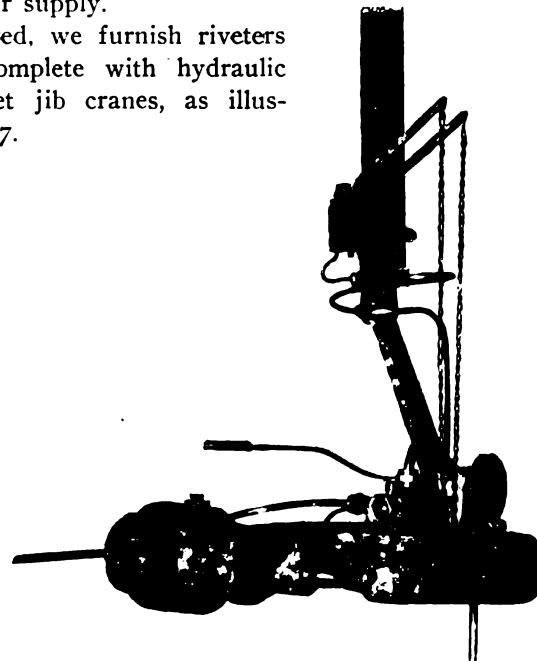


RIVETERS hung in different positions, illustrating the use of our compound hanging gear, which provides two centers of rotation at right angles to each other, thus rendering any position possible without breaking connections.

In riveting circular work, whether vertical or horizontal, such as furnace mouths, outside flanged boiler ends, etc., this device is especially useful, affording quick radial adjustment.

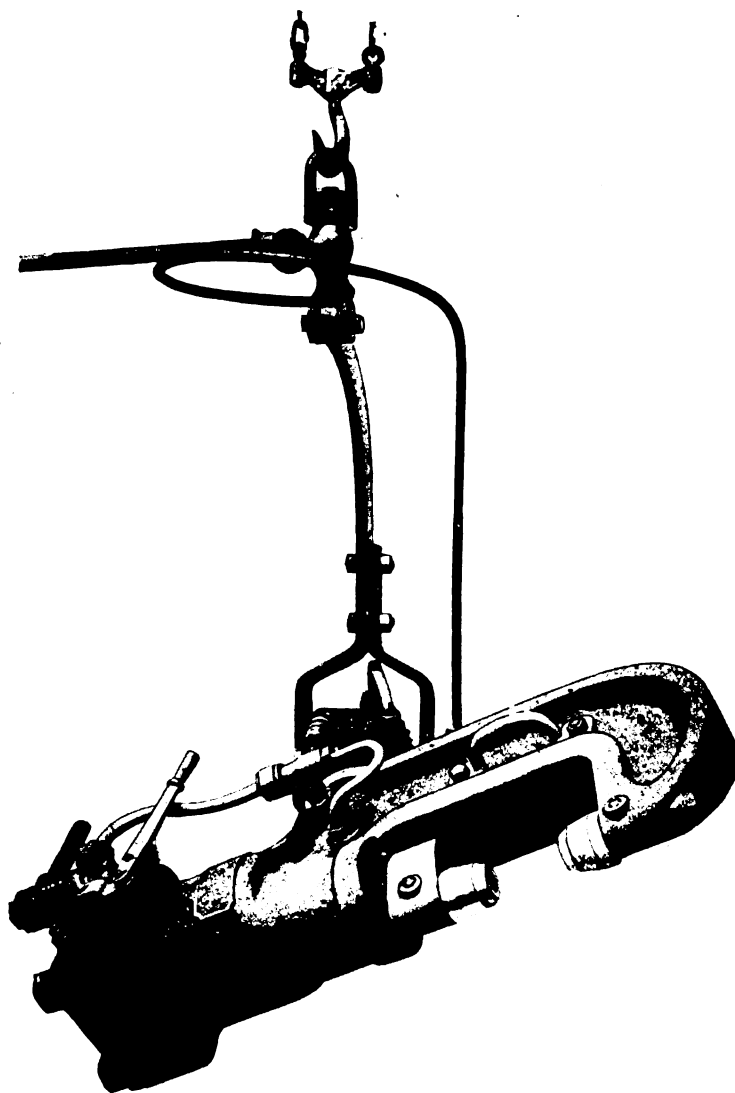
Two of the cuts show the lower end of a hydraulic lift, from which the riveter is suspended, and through which it receives its water supply.

When desired, we furnish riveters of this class complete with hydraulic lifts and bracket jib cranes, as illustrated on page 67.



This compound hanging gear is applied only to light riveters of 24" or less gap; and on riveters of 35 to 60 tons of 12" or less gap.

* For sizes, etc., use Code, pages 89-91.



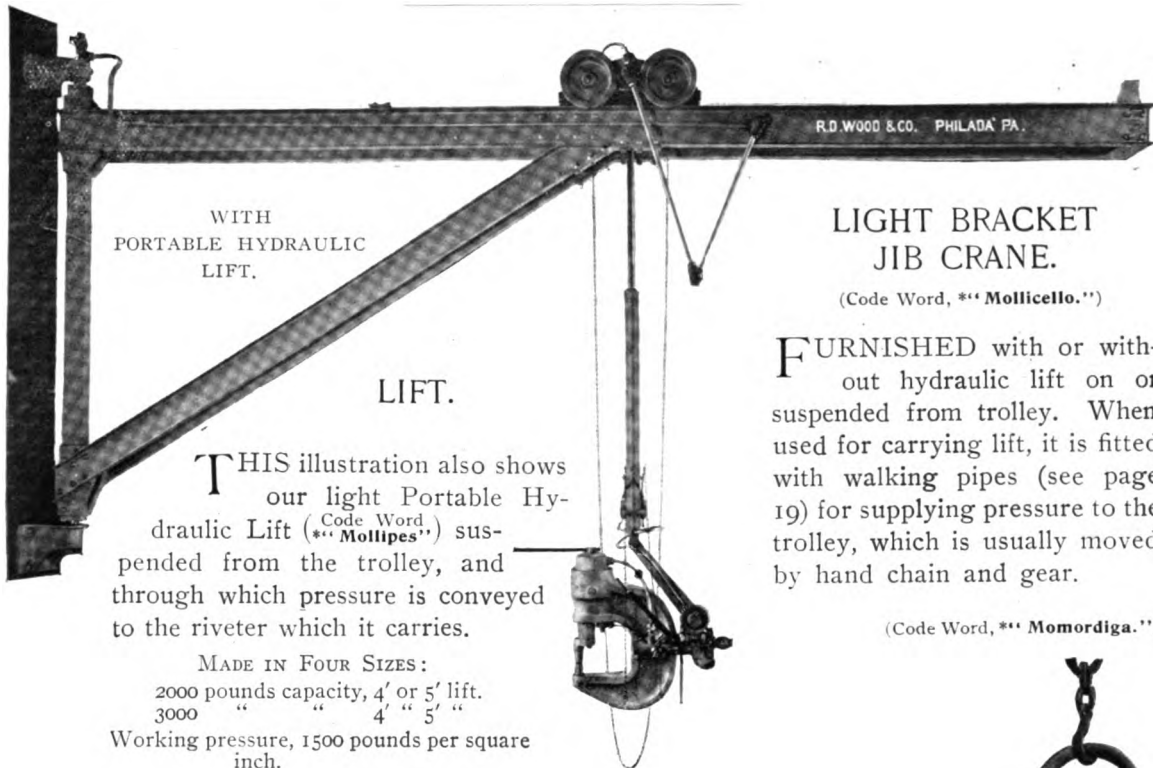
HYDRAULIC PORTABLE RIVETER.

(Code Word, *** *Munuscoli.* **)

50 tons capacity ; 6'' gap ; flush top ; working pressure, 1500 pounds per square inch.

DESIGNED for locomotive fire box or marine boiler work, the form of compound hanger taking up so little room as to make it especially suitable for this class of work.

* For sizes, etc., use Code, pages 89-91.



WITH
PORTABLE HYDRAULIC
LIFT.

LIGHT BRACKET JIB CRANE.

(Code Word, **"Mollicello."**)

FURNISHED with or without hydraulic lift on or suspended from trolley. When used for carrying lift, it is fitted with walking pipes (see page 19) for supplying pressure to the trolley, which is usually moved by hand chain and gear.

(Code Word, **"Momordiga."**)

LIFT.

THIS illustration also shows our light Portable Hydraulic Lift (**"Mollicello"**) suspended from the trolley, and through which pressure is conveyed to the riveter which it carries.

MADE IN FOUR SIZES:

2000 pounds capacity, 4' or 5' lift.
3000 " " 4' " 5' "

Working pressure, 1500 pounds per square inch.

Portable Horizontal Hydraulic Lifts (**"Mollicello"**) can be furnished for use where head-room is limited. Same capacity and lift as the vertical type listed above.

HEAVY PORTABLE HYDRAULIC LIFT.

(Code Word, **"Momordiga."**)

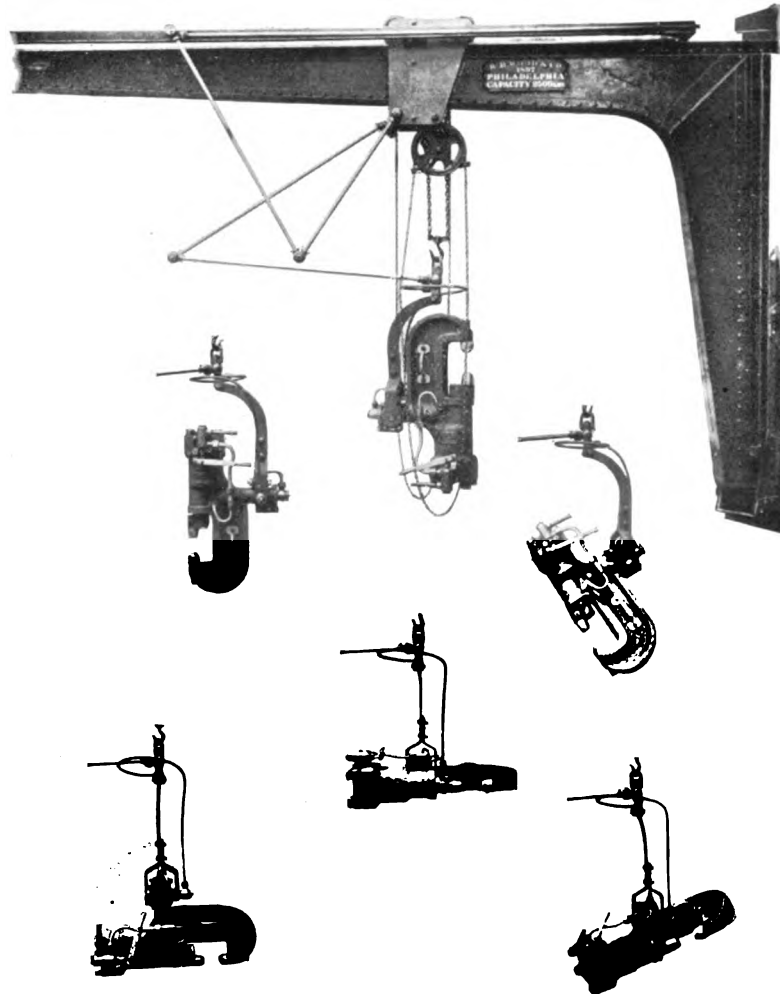
Working pressure, 1500 pounds per square inch.

THESE lifts do not convey the pressure to the portable riveter suspended from them, as do the ones above, but are arranged as shown in the cut of portable riveter on page 60, with the valve for controlling lift located on the riveter. When sold separately the valve is usually secured to the eye at the end of piston rod.

These lifts are also used with hand power traveling cranes to serve fixed hydraulic riveters (instead of the arrangement of tower crane) the valve being located on the side of the riveter and pressure carried to the lift by walking pipes and swivel joints. We have made them up to 60 tons capacity and 14 feet lift. Inquiries should state water pressure, capacity of lift and length of stroke.

We also build Hydraulic Walking Bracket Jib Cranes with fixed or rising jib, (**"Mollicello"**) complete with walking pipes, traverse gear, etc.





BRACKET JIB CRANE.

WITH SELF-SUPPORTING JIB.

(Code Word, "Musollera.")

3000 pounds capacity; 25' radius, or as ordered.

A BRACKET jib crane with jib arranged to allow the trolley to run back to the mast. The riveter is suspended by means of a chain hoist, and the pressure is carried to the riveter by walking pipes and swivels. The cut shows various positions in which the riveter can be hung by means of the compound hanger.

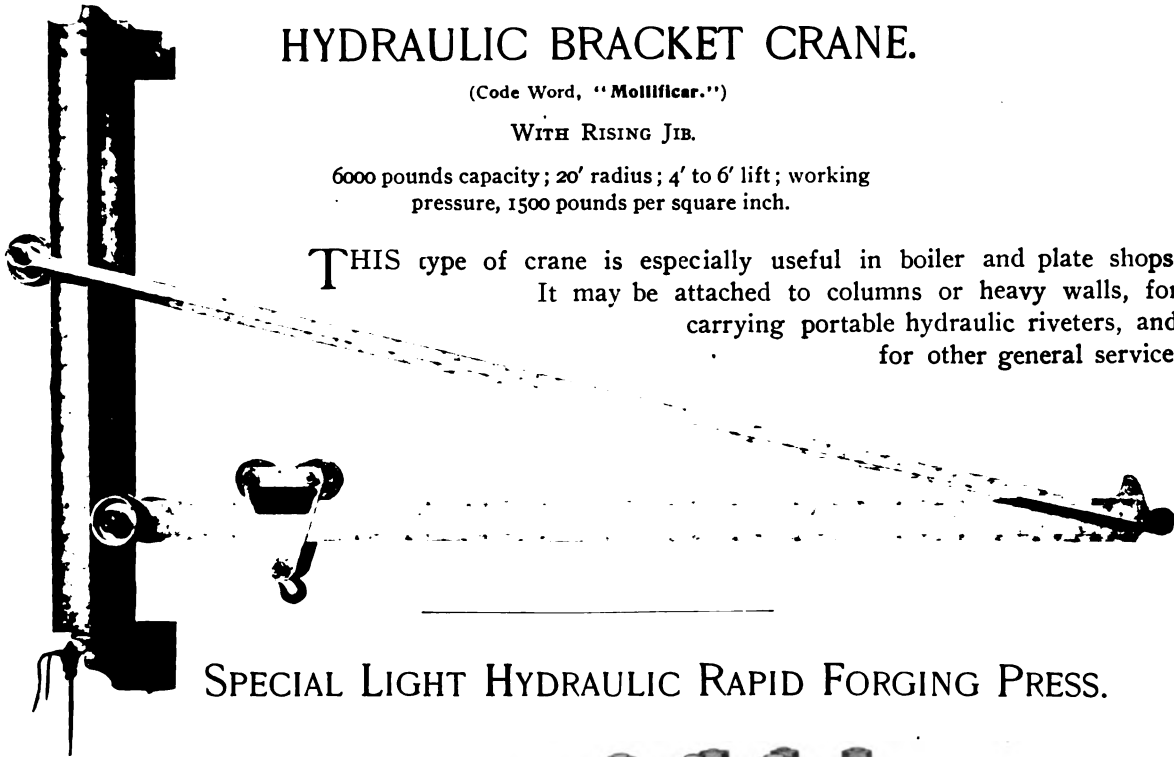
HYDRAULIC BRACKET CRANE.

(Code Word, "Mollificar.")

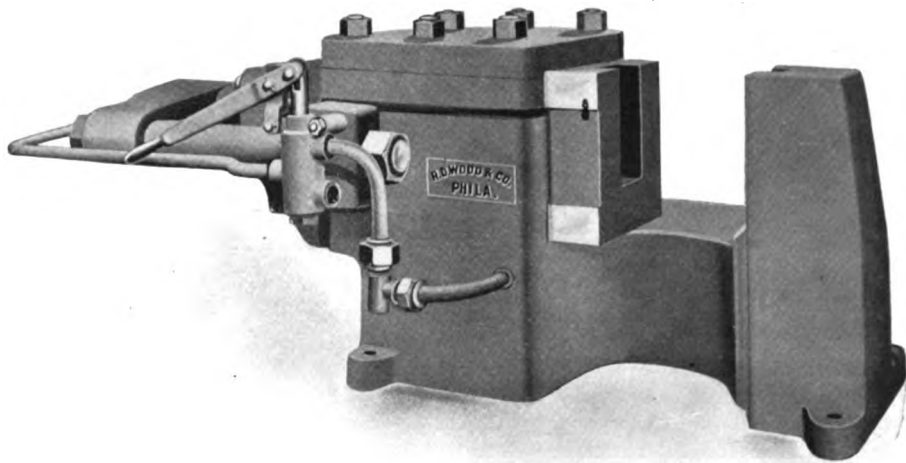
WITH RISING JIB.

6000 pounds capacity; 20' radius; 4' to 6' lift; working pressure, 1500 pounds per square inch.

THIS type of crane is especially useful in boiler and plate shops. It may be attached to columns or heavy walls, for carrying portable hydraulic riveters, and for other general service.



SPECIAL LIGHT HYDRAULIC RAPID FORGING PRESS.



Working Pressure, 1500 pounds.

(Code Word, "Tolleceran.")

THIS is a very serviceable tool for boiler shops. It is made of steel castings and is of a very rigid design. It is suitable for a variety of uses such as welding mud rings, flanging ogees on boiler shells and fire boxes, and other small flanging, bending and forging work. It has a very rapid action and exerts about 35 tons pressure.

PORTABLE HYDRAULIC RIVETERS.

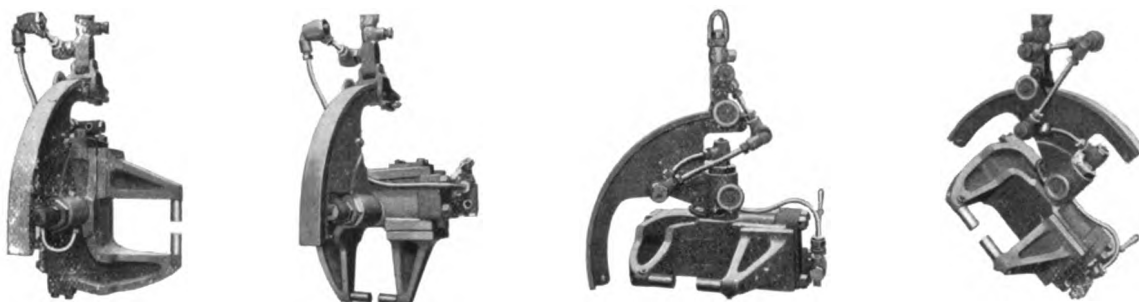
BEAR TYPE WITH SPECIAL HANGING GEAR.

(Code Word, "Tolvanera.")



PARALLEL TYPE WITH SPECIAL UNIVERSAL HANGING GEAR.

(Code Word, "Tolondrona.")



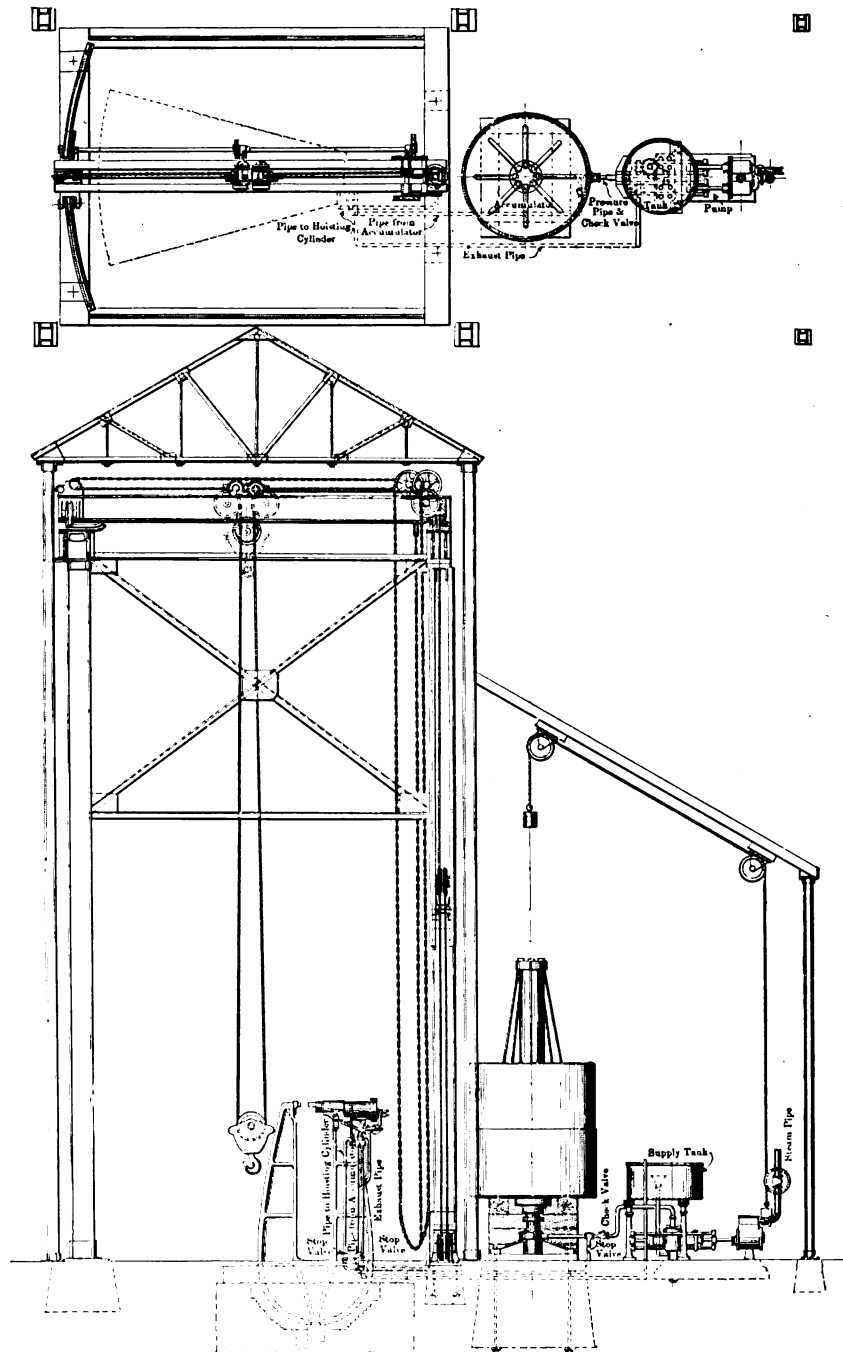
Capacity and depth of throat to suit requirements. See also page 63.

HYDRAULIC *vs.* STEAM RIVETING.

A PROMINENT manufacturing concern thus gives its experience in using hydraulic power for riveting:

"Until two years ago we were using the latest improved steam riveters for all of our boiler work. On the introduction of our hydraulic flanging plant, however, we changed our steam riveters by the application of hydraulic cylinders. We find that we are securing much more satisfactory results from the rivets driven by the hydraulic riveters than those driven by steam. This has been noticeable, especially in high pressure boiler work. We also find that the cost of power for operating hydraulic riveters is less, as with the 42" steam cylinders there was excessive condensation of steam.

"These works adopted hydraulic riveting a number of years ago on account of there being less chance for bad work by using this power. When we used two steam riveters we had an endless amount of trouble with leaky valves and leaky pistons. The crystallizing of rivets also was so serious that a head when knocked off from a rivet would be very badly crystallized, so much so that it would have the appearance of cast iron rather than of a good quality of wrought iron. Since abandoning steam we have used three hydraulic riveters, two with 6 feet gap and one with 17 feet gap, and we find that we have done away with all crystallization and the other troubles mentioned by pressing the rivet instead of hitting it a blow. We carry 1000 pounds hydraulic pressure on the hydraulic system and drive $\frac{7}{8}$ -inch and 1-inch rivets with 75 tons pressure on the rivet. This we have found does excellent work."—*American Manufacturer*, Pittsburg, December 4, 1896.



GENERAL ARRANGEMENT OF HYDRAULIC RIVETING PLANT.

THE above illustration shows a compact arrangement with relative position of triple power hydraulic riveter, radial tower crane with hydraulic hoist, accumulator, steam pump, suction tank and piping; also device for automatically controlling the operation of the pump. The pump and accumulator should be together, but they need not necessarily be close to the tools they supply; it is generally better to locate them in the engine room, where the pump may be under the charge of the engineer.

TOWER CRANES.

(Code Word, "Moltiplici.")

FOR BOILER SHOP FIXED RIVETER.

LIST OF SIZES.		
Lifting Power.		Height of Lift.
5 tons.....	30	to 35 feet.
10 ".....	30	" 35 "
15 ".....	30	" 40 "
20 ".....	30	" 40 "
25 ".....	30	" 50 "
40 ".....	30	" 50 "

FIXED riveters in boiler shops are usually served by means of hydraulic cranes placed over the machine in a tower. The hydraulic hoist ranges from 30 to 50 feet clear from the ground, the bridge having a travel of from 6 to 10 feet on each side of the riveter, and a trolley motion from 10 to 25 feet, depending upon the span of the crane.

In cranes of not more than 15 tons capacity, the bridge and trolley motions are usually operated through trains of suitable gearing by means of suspended hand chains, these chains being so located as to be operated from the riveter platform when work is being done. For illustration see second cut on next page.

In cranes from 20 to 40 tons capacity the bridge and trolley motions are best effected by means of hydraulic cylinders or by electric motors; if by hydraulic cylinders, the operating valves are located on the side of the riveting machine, and if by electric motors, the controllers are located on the riveter platform. The hoisting cylinders in these cranes are usually located on the floor directly back of the riveter and their operating valves placed on the side of the riveter.

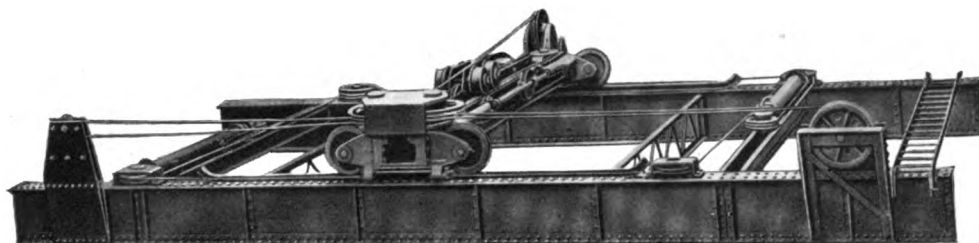
The essential features are that they shall be sensitive and readily adjusted from rivet to rivet. This sensitiveness is attained in our construction by means of perfect finish on the rams, large wheels and roller bearings, and steel wire hoisting ropes instead of chains. This combination, when operated by a sensitive valve, produces smooth action and is entirely devoid of a "jigger" motion.

The all-hydraulic tower crane, illustrated by first cut on the next page, has an advantage over other types in that there is only one kind of power to deal with, and the cost of the power installation is not increased over that required to operate the riveting plant with bridge and trolley motions by hand power, as when the bridge or trolley is being moved the hoisting cylinder is not usually required, or, if operated, at a moderate speed only.

RADIAL TOWER CRANE.

(Code Word, "Molybden.")

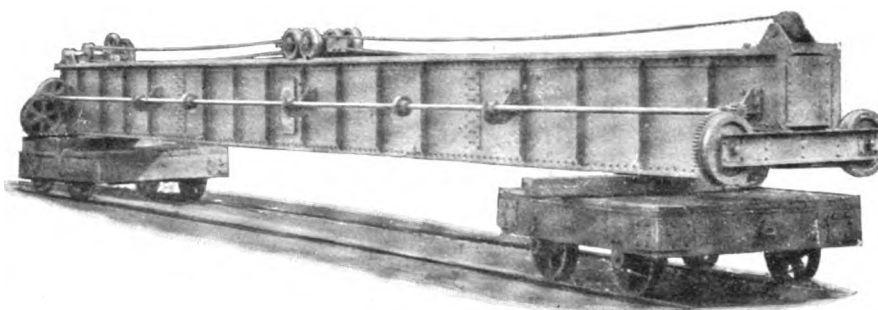
WE build Tower Cranes, sizes as above, with one end on a pivot over the riveter, the other traveling on a circular track. This arrangement has obvious advantages, as the arc of its travel is practically unlimited. This type of crane is illustrated on preceding page, also by third cut on next page.



ALL-HYDRAULIC TOWER CRANE.

(Code Word, "Murador.")

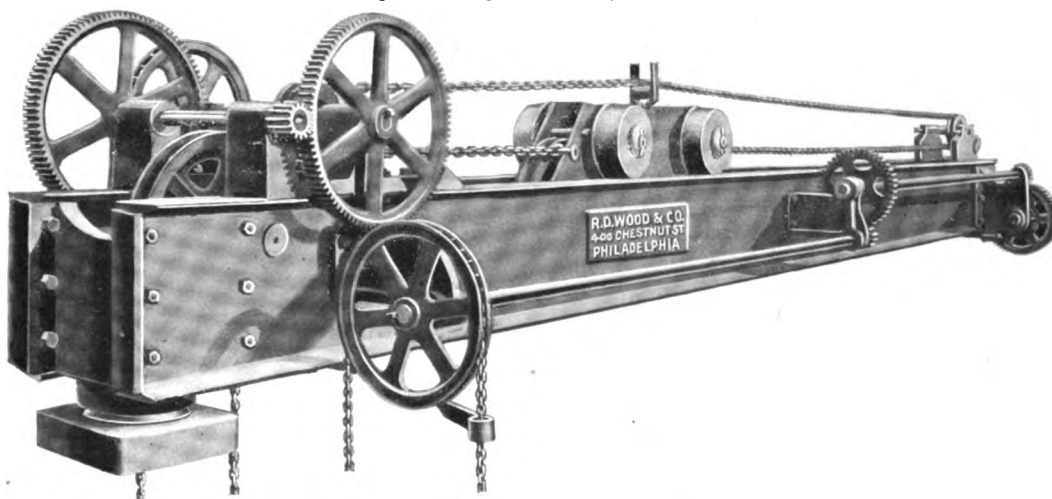
Any desired capacity and span ; hoisting cylinder, being located vertically, is not shown.



HYDRAULIC TOWER CRANE, RECTANGULAR TYPE.

(Code Word, "Tombolare.")

Hand-power bridge and trolley movements.

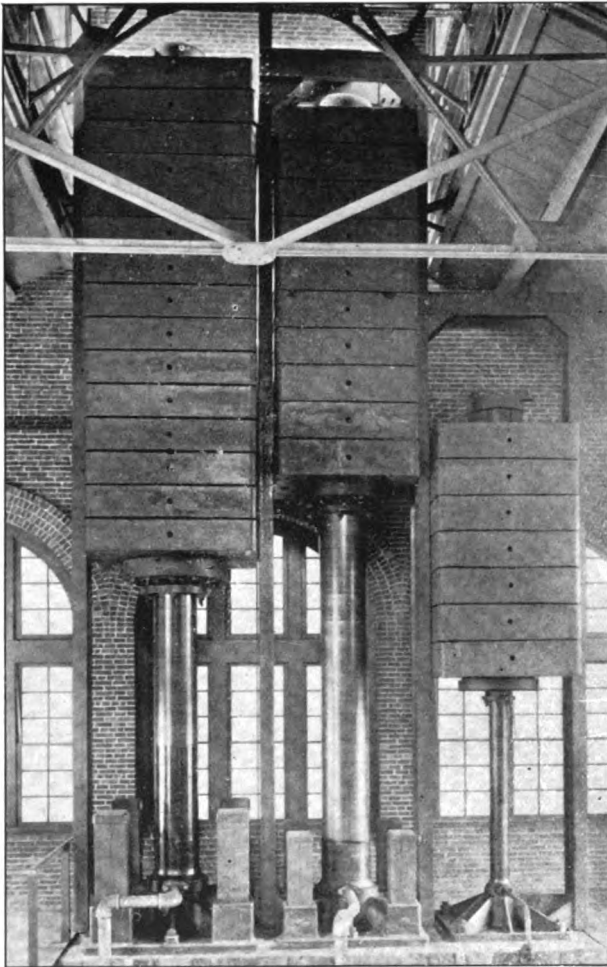


HYDRAULIC TOWER CRANE, RADIAL TYPE.

(Code Word, "Molybdan.")

Hand-power bridge and trolley movements.

HYDRAULIC ACCUMULATORS.



SET OF ACCUMULATORS FOR 300, 750 AND 1500 POUNDS
PRESSURE.

NEARLY every class of hydraulic machinery is best operated through the intervention of an accumulator, serving as a reservoir of power which it is capable of supplying far more quickly than could be done from the pump direct. A good installation is so proportioned that the pump works continuously and slowly, the accumulator taking care of all the sudden variations in demand for water; hence, as a general rule, the accumulator should be large and the pump small.

The illustration shows a group of three accumulators, giving pressures of 300, 750 and 1500 pounds per square inch respectively; the weight in this instance being supplied by cast-iron blocks.

The usual and cheaper construction, however, is to surround the cylinder with a light plate steel tank of sufficient capacity to carry stone, furnace cinder, scrap or punchings for ballast. Unless otherwise specified, the ballast tanks furnished with our accumulators will be of such dimensions as to require a ballast weighing about 200 pounds per cubic foot.

These accumulators are usually not provided with guides, as we do not deem them necessary except in special cases of long stroke or where several are grouped together. The cylinders are guided on the rams, the length of the bearing being about

three times the diameter of the ram, the latter being fitted in very large, heavy bases.

All our accumulators are provided with devices for the purpose of preventing over-pumping in case the automatic mechanism which controls the pump should fail to work. When accumulators are sold separately the automatic mechanism for controlling the pump is not furnished, unless specially ordered. When so ordered, full data regarding the character of the pump and its location relative to the accumulator should be furnished.

HYDRAULIC ACCUMULATORS.

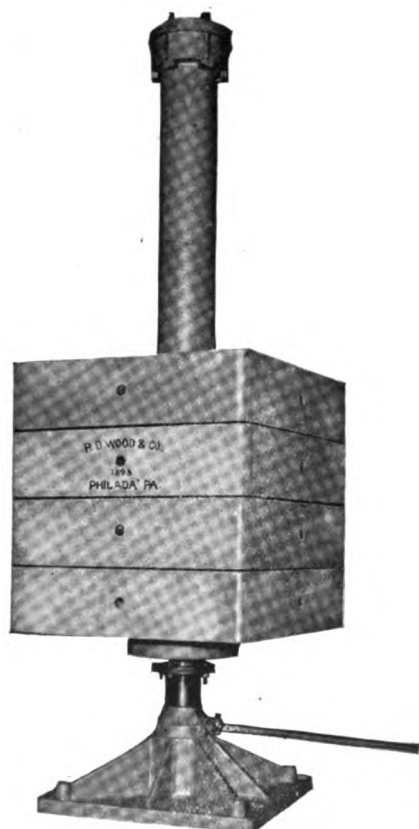
INVERTED TYPE.

TABLE OF SIZES.

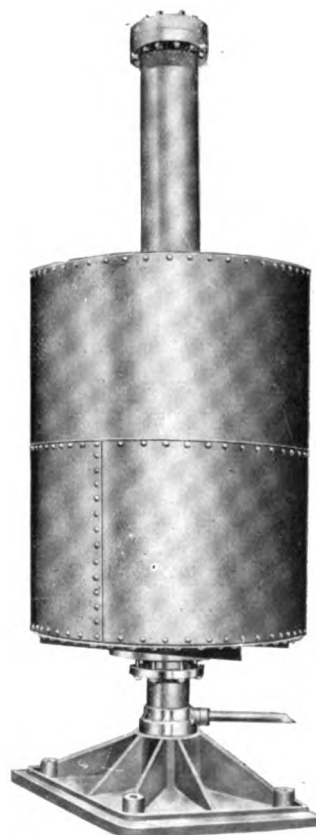
Made for any desired pressure.

Diameter	Stroke	WITH BALLAST TANK Code Words	WITH C.-I. WEIGHTS Code Words
4½"	5 feet	Montatigo	Montantada
6	6 "	Montecitos	Mustarius
8	8 "	Montiamo	Mutabills
10	10 "	Monticule	Mutaglioni
10	12 "	Myagros	Mutatura
12	12 "	Montirung	Mulinerete
12	15 "	Myopathy	Mulacchia
15	12 "	Montoncino	Mujerona
18	12 "	Moqueado	Mugnitore
20	12 "	Moquifero	Mugliava

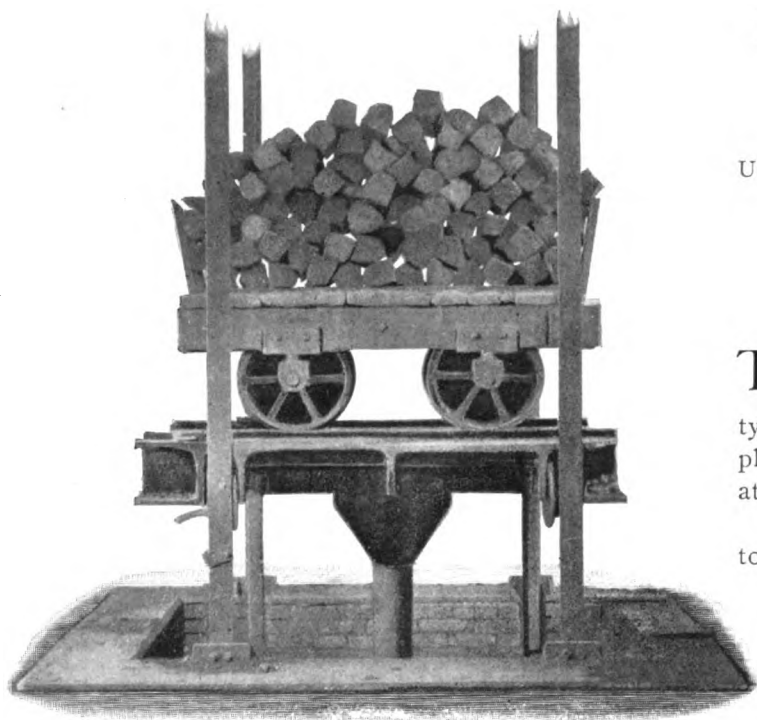
Made without casing or weights if required. Other sizes with variations in stroke as required.



HYDRAULIC ACCUMULATOR.
INVERTED CYLINDER TYPE.
WITH CAST-IRON WEIGHTS.



HYDRAULIC ACCUMULATOR.
INVERTED CYLINDER TYPE.
WITH BALLAST TANK.



DIRECT-ACTING ELEVATORS.

WE are prepared to build direct-acting elevators for freight stations, baggage and warehouse work.

Also the pumps, pressure tanks, piping, etc., for complete equipment.

We have recently constructed a complete equipment for freight station work, including five 15,000-pound elevators 33' stroke, platforms 9' x 14'.

Rams were cast on end; each one a single casting.

HYDRAULIC PLATFORM HOIST.

(Code Word, "Moniscono.")

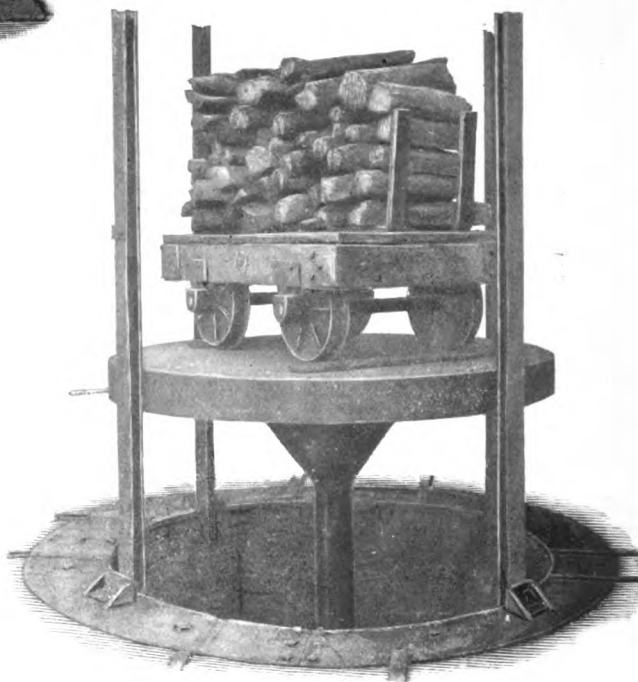
Usual working pressure, 300 pounds per square inch.

STANDARD SIZES.

4,000 pounds capacity.....	8'	to	32'	lift.
6,000 " " " " " "	8'	"	32'	"
10,000 " " " " " "	8'	"	32'	"

THE platforms may be square, rectangular or round, as preferred (the last-named type to revolve). Motion controlled from platform, and arranged to stop automatically at top and bottom.

Larger sizes for mill and railroad service to order.

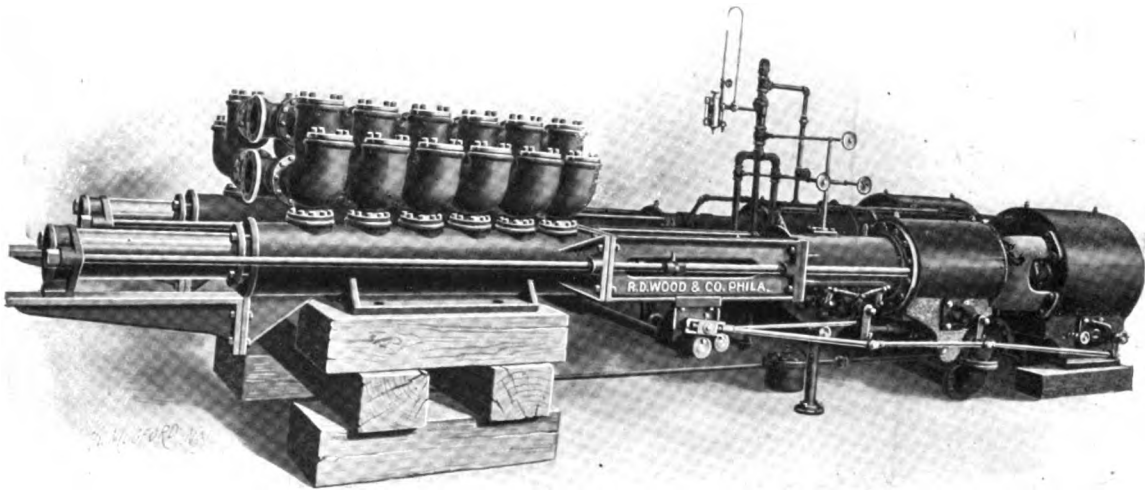


HYDRAULIC CUPOLA HOIST.
WITH REVOLVING TABLE.

(Code Word, "Monivate.")

TRIPLE EXPANSION PRESSURE PUMP.

(Code Word, "Templates.")



THIS pump is designed with special reference to the severe and exacting conditions which are met with in the hydraulic systems of rolling mills, steel works, mines and other plants where water is required under heavy pressures. The design illustrated combines, in addition to other points, three most essential features for this class of work, viz, durability, simplicity and economy. The water end is made entirely from steel castings; the valves are placed in valve chambers of the pot form; the plungers are four in number, single-acting and outside packed; the steam end is of the triple expansion type, consisting of two high-pressure, two intermediate-pressure and two low-pressure cylinders; the steam valves are of the semi-rotative type, located under the cylinders. On economy tests this pumping engine has developed a duty exceeding 100,000,000 foot-pounds per 1000 pounds of steam. This pump requires no more engineering skill or attention than the ordinary compound pump, and the saving it effects in fuel, as well as in the required size of boiler plant, very quickly offsets the slightly greater first cost.

In applying for prices, state quantity of water to be pumped per minute, total water pressure per square inch and effective steam pressure.

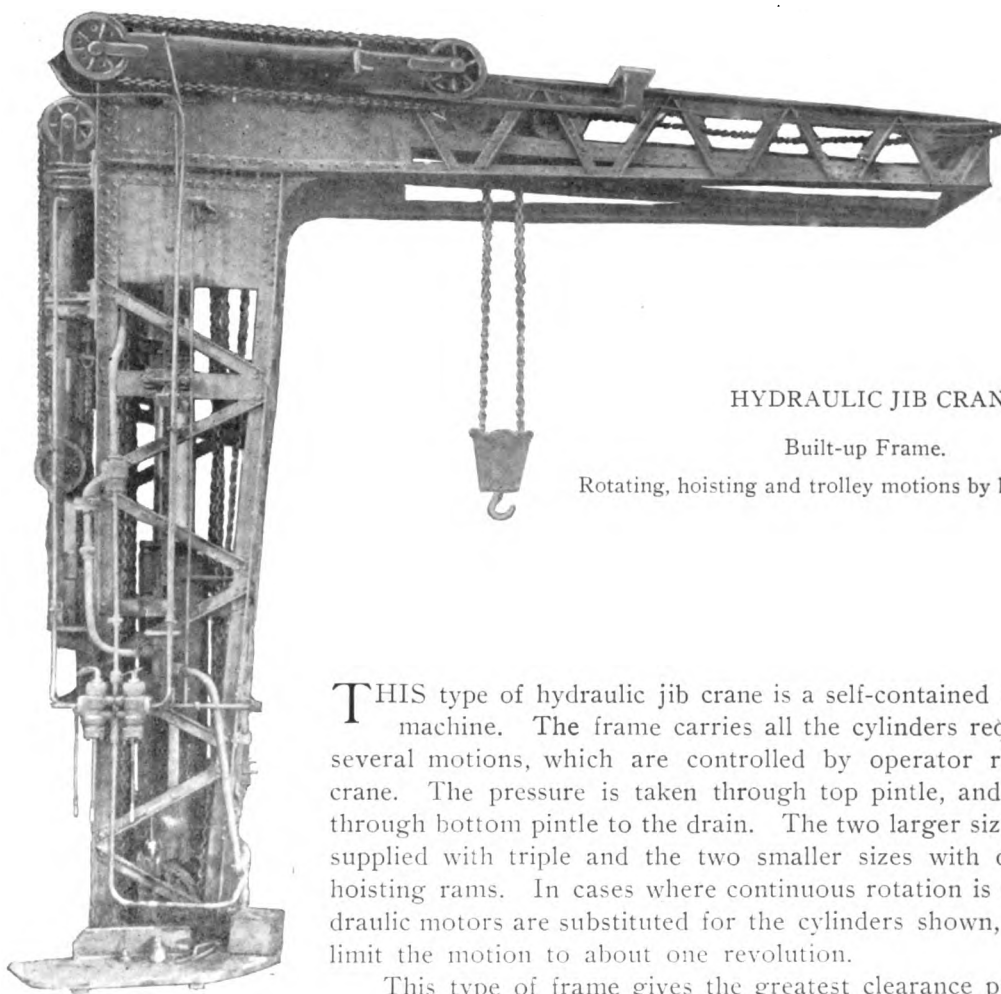
ALL-HYDRAULIC JIB CRANE.(Code Word, "**Mondaccio.**")**WITH BUILT-UP FRAME.**

All motions by hydraulic power.

Usual working pressures, 300 to 750 pounds per square inch.

STANDARD SIZES.

50,000	pounds capacity,	frame dimensions	and hoist as required.						
40,000	"	"	"	"	"	"	"	"	"
30,000	"	"	"	"	"	"	"	"	"
20,000	"	"	"	"	"	"	"	"	"

**HYDRAULIC JIB CRANE.**

Built-up Frame.

Rotating, hoisting and trolley motions by hydraulic power.

THIS type of hydraulic jib crane is a self-contained and complete machine. The frame carries all the cylinders required for the several motions, which are controlled by operator riding on the crane. The pressure is taken through top pintle, and the exhaust through bottom pintle to the drain. The two larger sizes are usually supplied with triple and the two smaller sizes with double power hoisting rams. In cases where continuous rotation is desirable, hydraulic motors are substituted for the cylinders shown, as the latter limit the motion to about one revolution.

This type of frame gives the greatest clearance possible under the jib and close up to the mast.

COMBINED HYDRAULIC AND POWER JIB CRANE.

(Code Word, "**Monchlein.**")

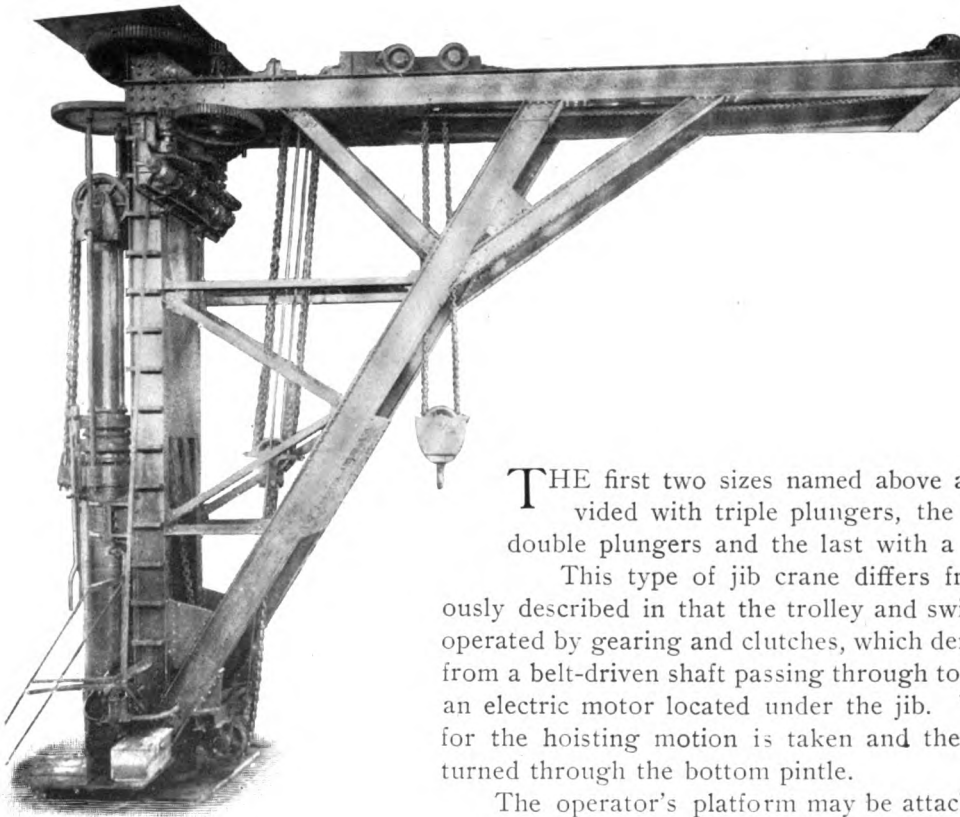
HYDRAULIC LIFTING CYLINDER.

TROLLEY AND SWING GEAR, DRIVEN FROM SHAFT OR ELECTRIC MOTOR.

Usual working pressures, 300 to 750 pounds per square inch.

STANDARD SIZES.

50,000	pounds capacity,	frame dimensions	and hoist	as required.
40,000	"	"	"	"
30,000	"	"	"	"
20,000	"	"	"	"
10,000	"	"	"	"



COMBINED HYDRAULIC AND
POWER JIB CRANE.

THE first two sizes named above are usually provided with triple plungers, the next two with double plungers and the last with a single plunger.

This type of jib crane differs from that previously described in that the trolley and swing motions are operated by gearing and clutches, which derive their power from a belt-driven shaft passing through top pintle or from an electric motor located under the jib. Water pressure for the hoisting motion is taken and the exhaust is returned through the bottom pintle.

The operator's platform may be attached to the mast at any desired height; and the frame design altered to correspond with that shown on the preceding page.

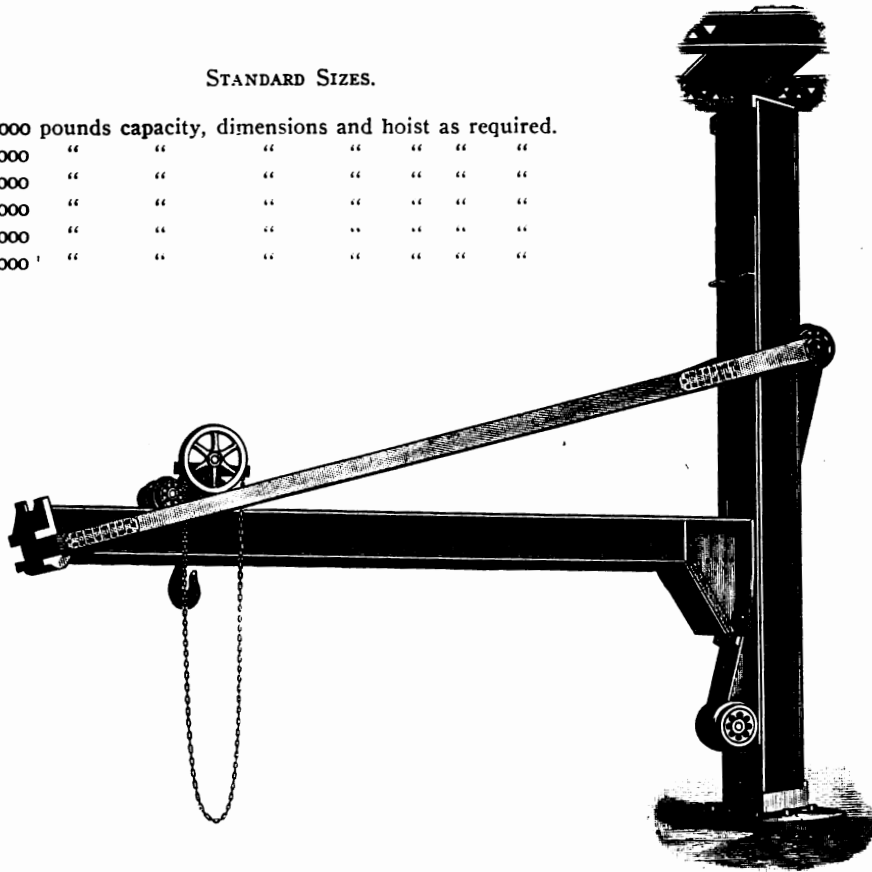
HYDRAULIC RISING JIB CRANE.

(Code Word, "Monasticon.")

Usual working pressures, 300 to 750 pounds per square inch.

STANDARD SIZES.

50,000 pounds capacity, dimensions and hoist as required.							
40,000	"	"	"	"	"	"	"
30,000	"	"	"	"	"	"	"
20,000	"	"	"	"	"	"	"
10,000	"	"	"	"	"	"	"
5,000	"	"	"	"	"	"	"



Engraved from photograph of Heavy Hydraulic Rising Jib Crane.
50,000 pounds capacity; 34' radius; 11' lift.

THE simplest and least costly type of hydraulic jib crane. The height of lift and radius is, however, limited. The cylinder is placed partly below ground level, and the load is carried by the ram independently of the frame; hence the weight of the frame only rests upon the base rollers, resulting in unusual ease of rotation.

The vertical wheel base is increased 50 per cent. over that obtained by the usual construction, which results in much less strain on the mast, jib, wheels and axles.

HYDRAULIC JIB CRANE.

(Code Word, "Monatario.")

FOR SHOP USE.

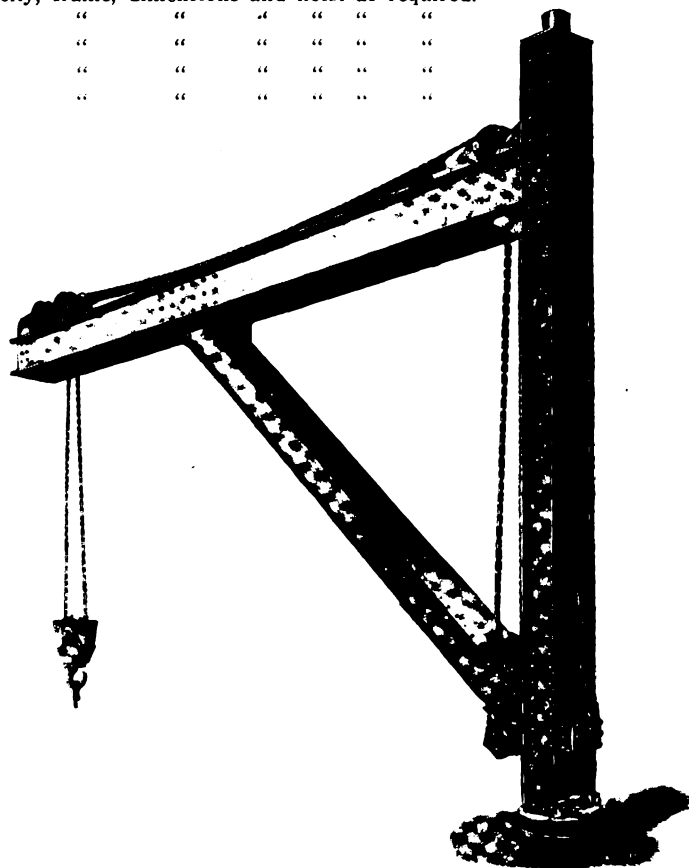
With hand trolley traverse gear.

Usual working pressures, 300 to 750 pounds per square inch.

STANDARD SIZES.

(Various modifications.)

50,000 pounds capacity, frame, dimensions and hoist as required.								
40,000	"	"	"	"	"	"	"	"
30,000	"	"	"	"	"	"	"	"
20,000	"	"	"	"	"	"	"	"
10,000	"	"	"	"	"	"	"	"



HYDRAULIC JIB CRANE.

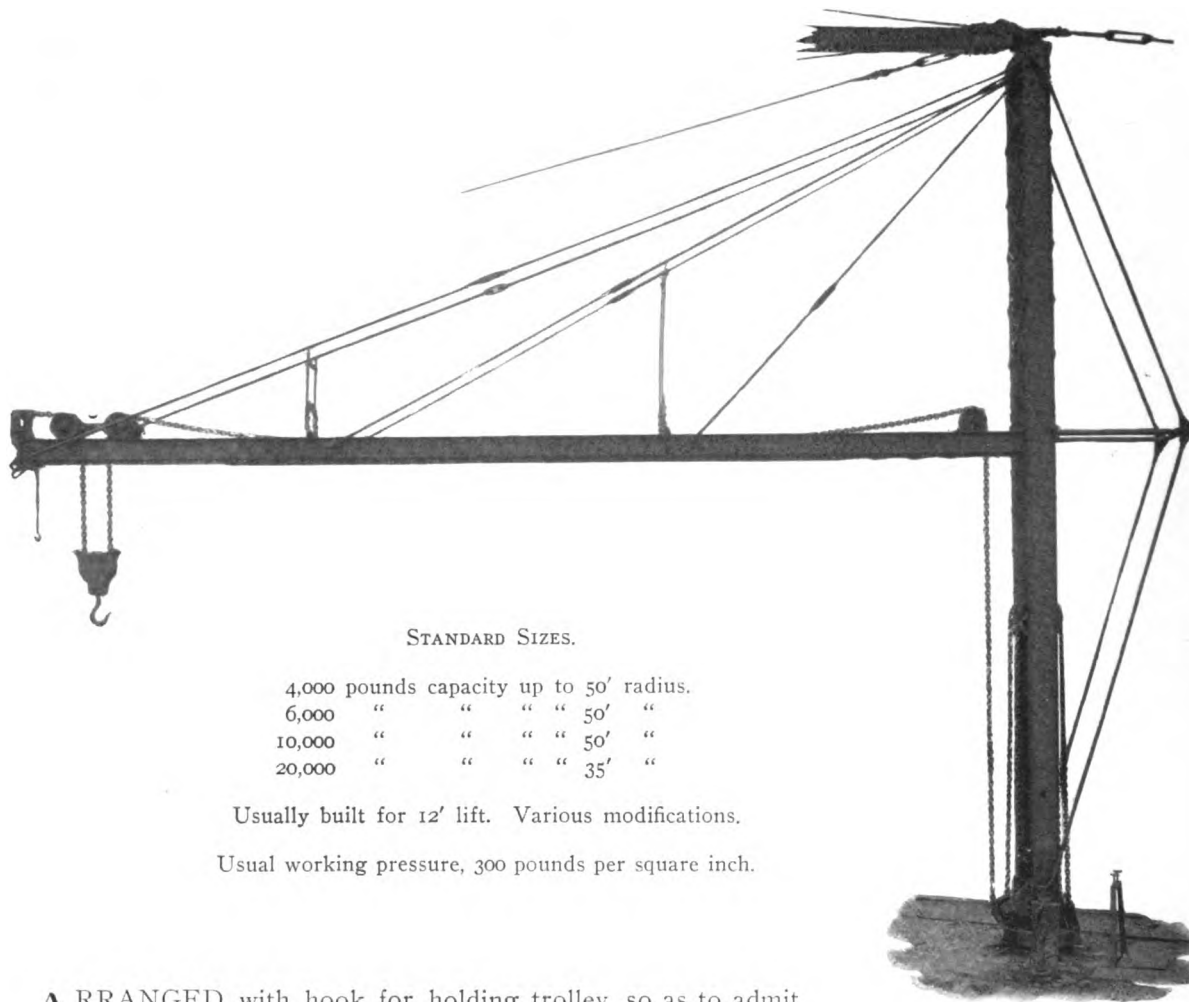
20,000 pounds capacity; working pressure,
750 pounds per square inch.

THE first two sizes named above are usually provided with triple plungers, the next two with double plungers and the last with a single plunger.

This crane has the same construction to afford ease of rotation as that shown on the previous pages, but the jib is rigidly supported at a fixed height and the motion of the ram conveyed by means of chains to the load hanging from the trolley. This type of crane usually admits of more vertical hoist than the type shown on the preceding page, but the trolley does not move so easily.

HYDRAULIC YARD OR WHARF CRANE.

(Code Word, "Monandrian.")



STANDARD SIZES.

4,000	pounds	capacity	up to	50'	radius.
6,000	"	"	"	50'	"
10,000	"	"	"	50'	"
20,000	"	"	"	35'	"

Usually built for 12' lift. Various modifications.

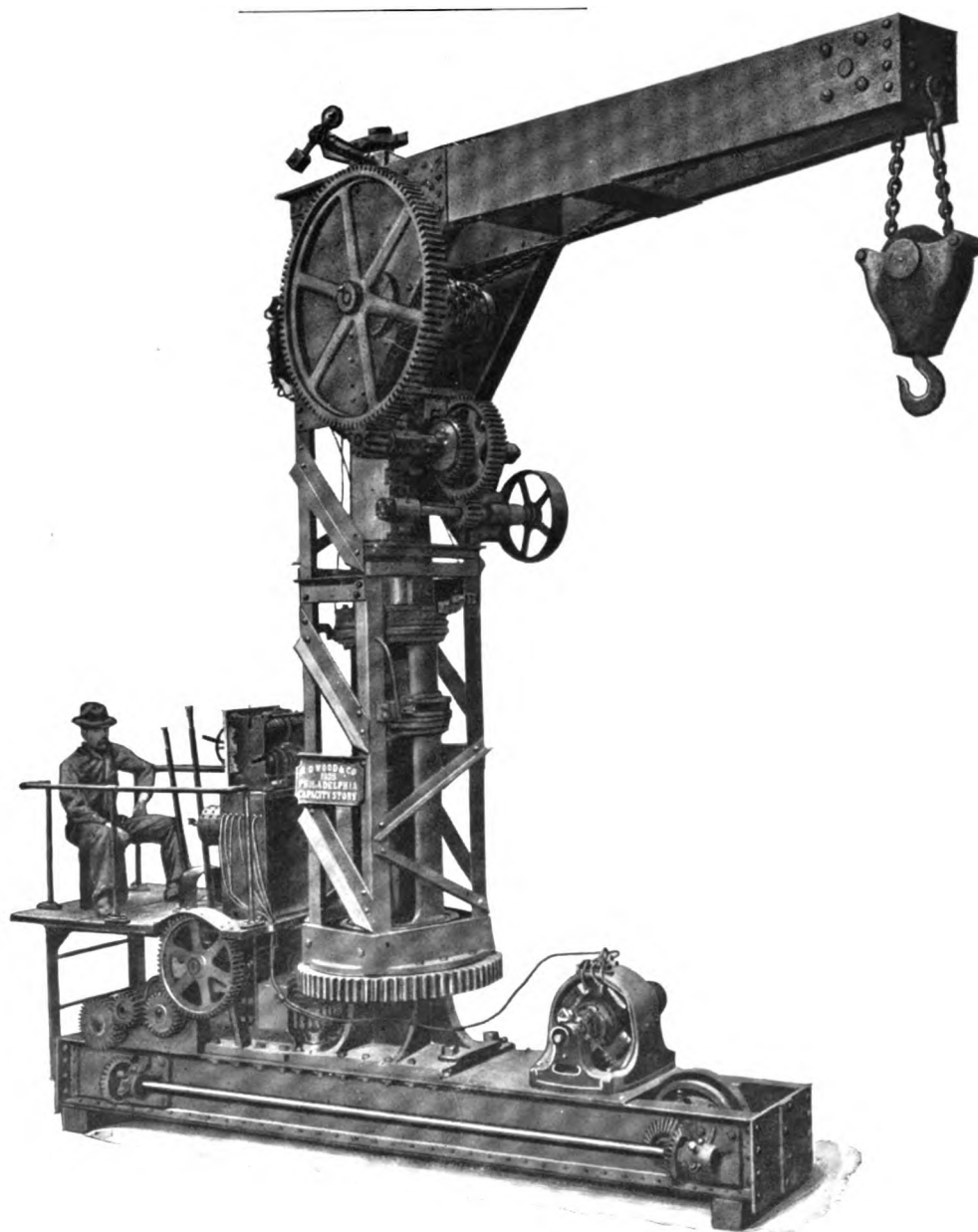
Usual working pressure, 300 pounds per square inch.

ARRANGED with hook for holding trolley, so as to admit of removing hook-block, and using single hitch, doubling the hoist for half the load. This is desirable on wharf work especially.

The 5 and 10-ton cranes are provided with double plungers, the small one usually handling one-third to one-fourth of the full load, with economy of power and increased speed.

They are remarkable for their ease of rotation under full load, only the weight of the frame coming upon the base rollers, the load being carried upon the water. As the cylinders are buried, this type of crane is well adapted to outdoor service. When for use inside a building, a head block is furnished, and the cylinder raised as high as convenient.

HYDRAULIC YARD OR WHARF CRANE.

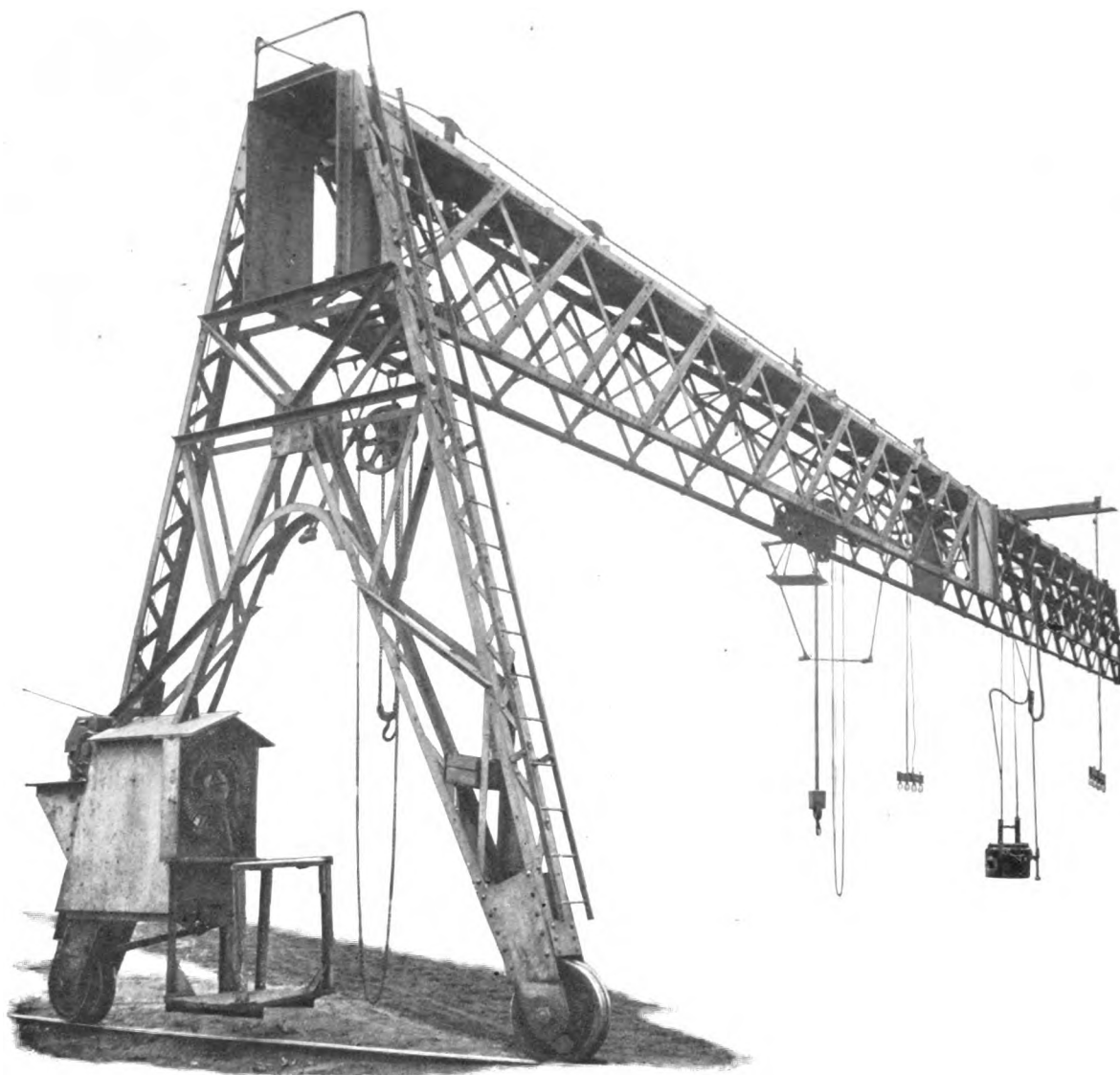


ELECTRIC WALKING JIB CRANE.

(Code Word, "Murchas.")

Capacity, 5 tons; mast, 20' high; jib, 13' radius.

A VERY useful crane in such places as low-ceiled shops filled with overhead belts and shafting, where it is not convenient to install a regular traveling crane. The top of the mast is supported by a roller running in a channel-shaped trough secured to roof or ceiling.



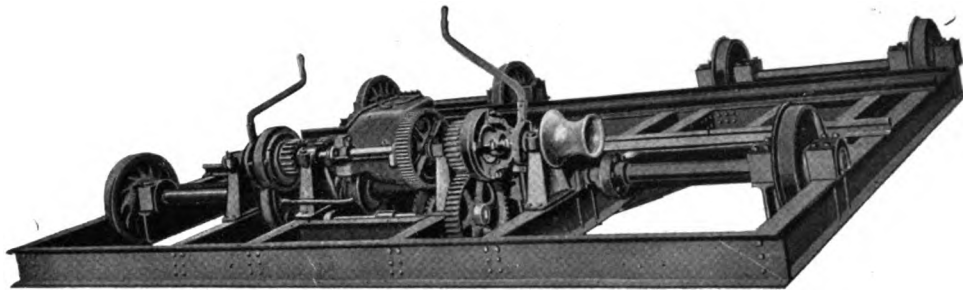
COMBINED HYDRAULIC AND ELECTRIC PIVOT CRANE.

(Code Word, " **Monicongo.** ")

WITH HYDRAULIC HOIST AND ELECTRIC ROTATION.

Track, 200' diameter.

WE make a specialty of long-span, pivot cranes, gantries, etc., with hydraulic, pneumatic and electric power motions and equipment as duty and location may require. Especially adapted to outdoor service. Capacities, dimensions, speeds, etc., to suit the intended service.



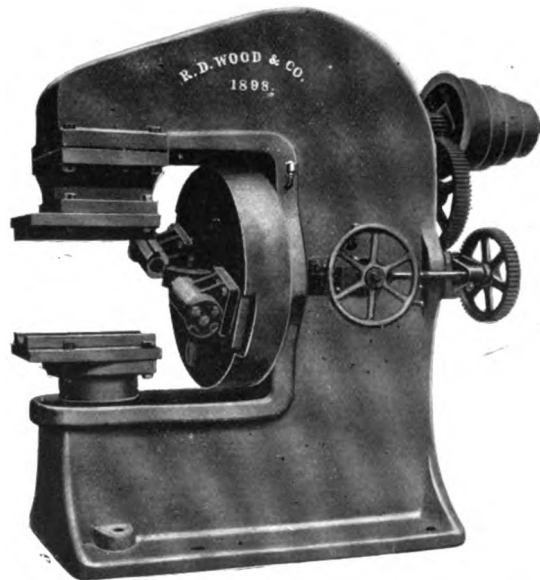
ELECTRIC TRANSFER TABLE.

FOR LOCOMOTIVE AND CAR SHOPS.

(Code Word, "Flurcianna.")

40 tons capacity; 25' span.

WE are prepared to design and build electric transfer tables of any capacity and length. Inquiries should state capacity and speed, also length of rail required, character of electric current available and whether wanted with or without cabin over operating mechanism.



CUTTING-OFF MACHINE.

WITH HYDRAULIC CLAMPING CYLINDER.

(Code Word, "Murexides.")

THE above cut illustrates an interesting application of hydraulic power to a special, rigid machine tool. A hydraulic cylinder is mounted in lower part of housing for clamping the article to be operated on. It does its work rapidly and holds firmly.

HYDRAULIC MEMORANDA.

One lb. pressure per sq. in. = 2.31 ft. head of water.

100 ft. head = 43.3 lbs. per sq. in., or pressure = head $\times$.433.

Head in ft. = pressure in lbs. per sq. in. $\times$ 2.31.

Average weight of water per cu. ft. = 62½ lbs.

One cu. ft. = 7½ gallons (7.48 exactly).

One gallon (U. S.) = 231 cu. in. and weighs 8½ lbs.

One cu. in. = .03617 lbs.

Mean atmospheric pressure = 14.7 lbs. per sq. in., which is equal to a column of water 33.9 ft. high. Hence a perfect vacuum in a suction tube or condenser will sustain a column of water about 34 ft. high.

Horse Power.—One horse power = 33,000 ft. lbs. of work done per minute = 530 cu. ft. (or 3975 gallons) of water falling 1 ft. per minute or 5.3 cu. ft. falling 100 ft. per minute. These are the theoretical figures, which do not cover any loss by friction.

Energy.—The energy in water under pressure is found by multiplying its volume in cu. ft. by its pressure in lbs. per sq. ft. Thus the energy contained in 100 gallons of water under a pressure of 1500 lbs. per sq. in. = $\frac{100 \times 1500 \times 144}{7.5} = 2,880,000$ ft. lbs., and if this is all used in one minute we have $\frac{2,880,000}{33,000} = 87\frac{1}{4}$ horse power.

One cubic foot at 1500 lbs. per sq. in. = 216,000 ft. lbs. = 6½ horse power if used in one minute.

One gallon at 1500 lbs. per sq. in. = 29,000 ft. lbs. = $\frac{7}{8}$ horse power if used in one minute.

The table below gives the amount of power readily conveyed by various sizes of pipe under a pressure of 1500 lbs. per square inch and a velocity of 75 ft. per second, which velocity is quite permissible for short lengths of pipe.

Internal Diameter of Pipe	Gallons Passing per Minute	Horse Power
$\frac{1}{4}$ "	11	10
$\frac{1}{2}$ "	45	40
$\frac{3}{4}$ "	102	90
1"	180	160
1½"	406	350
2"	722	630

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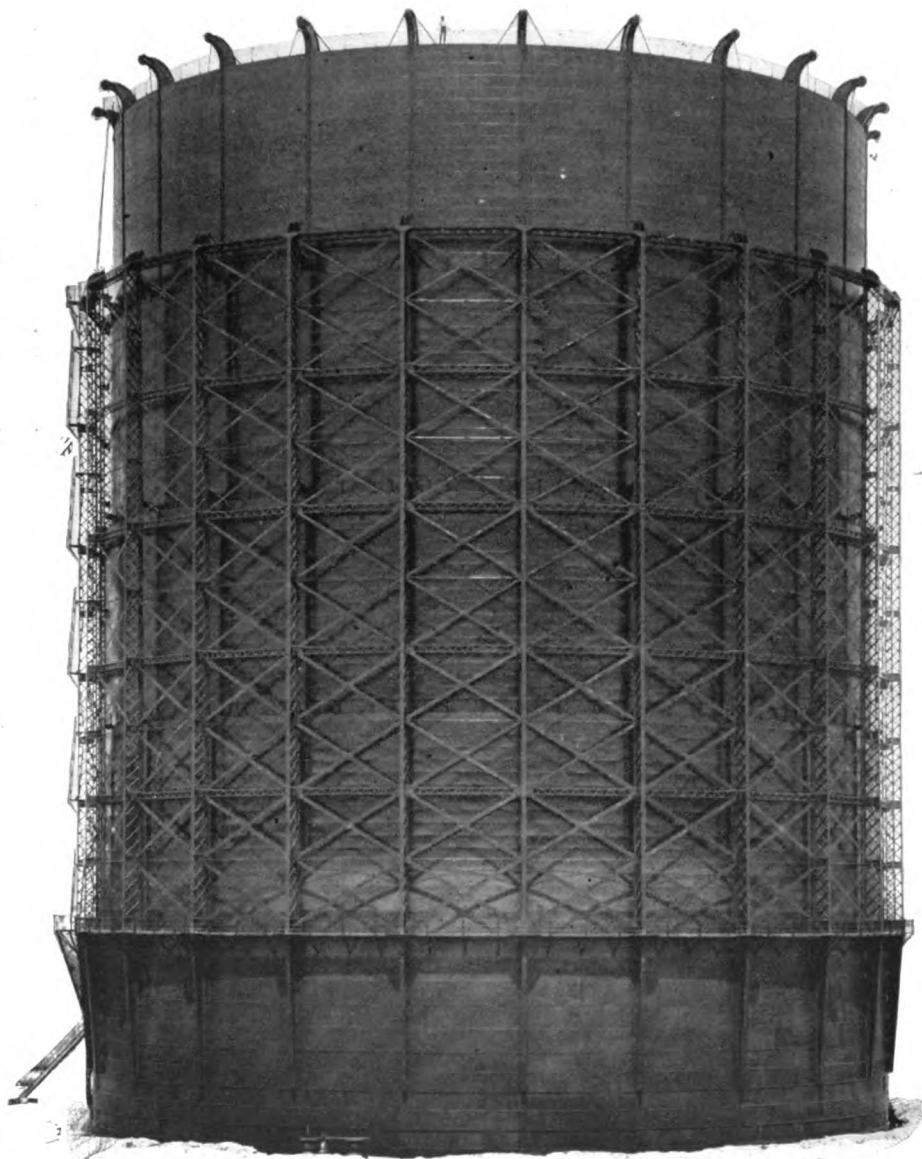
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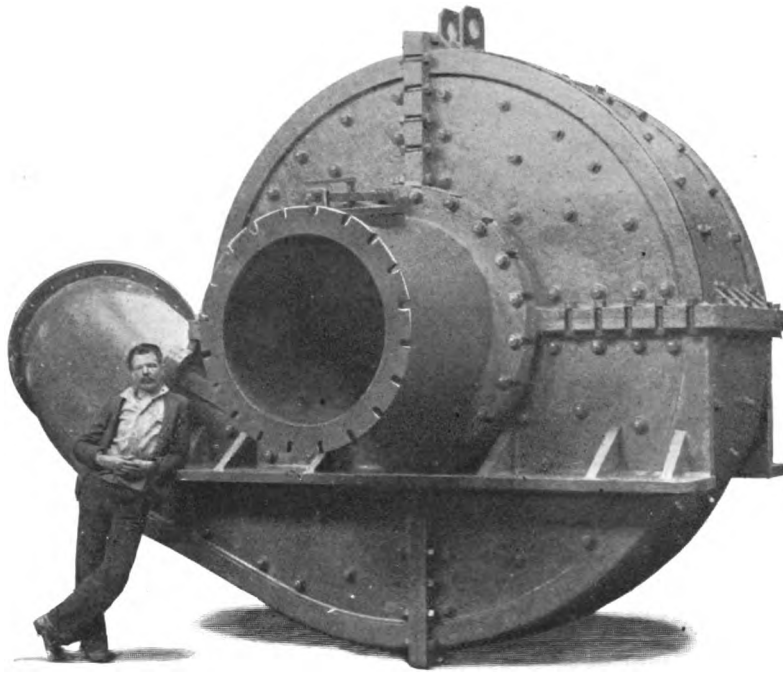
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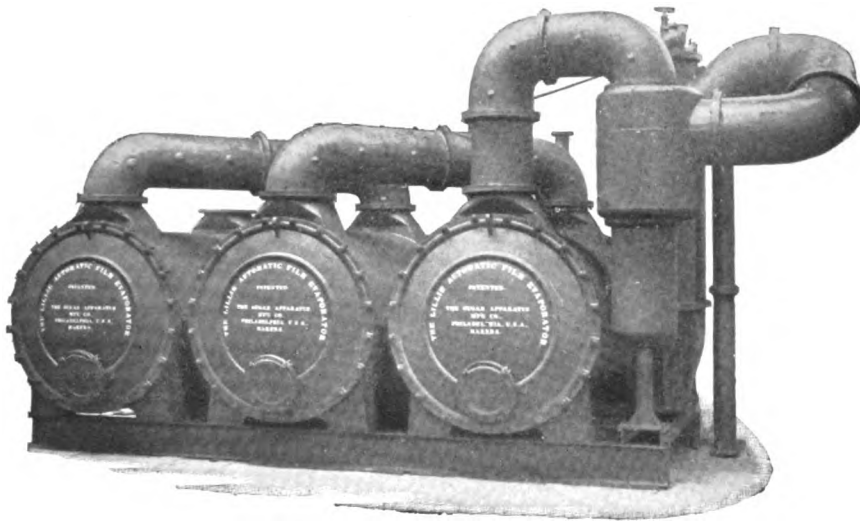
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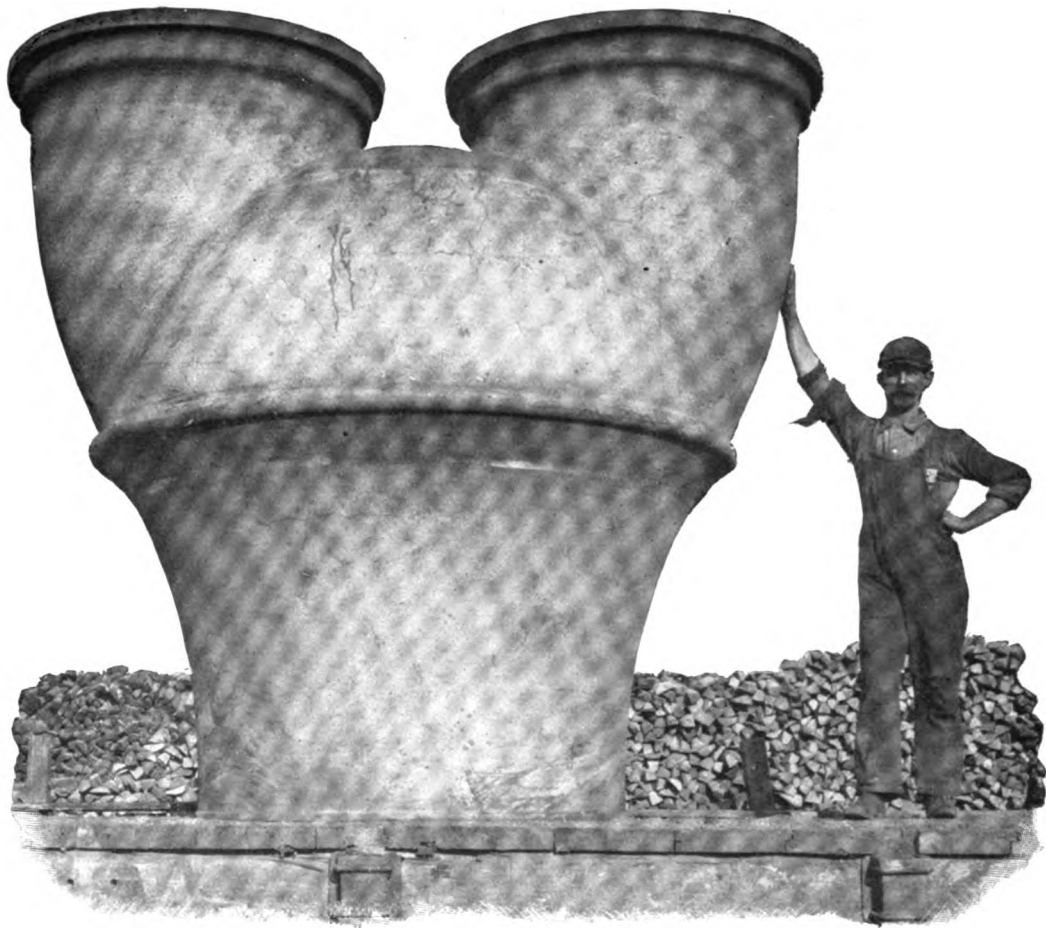


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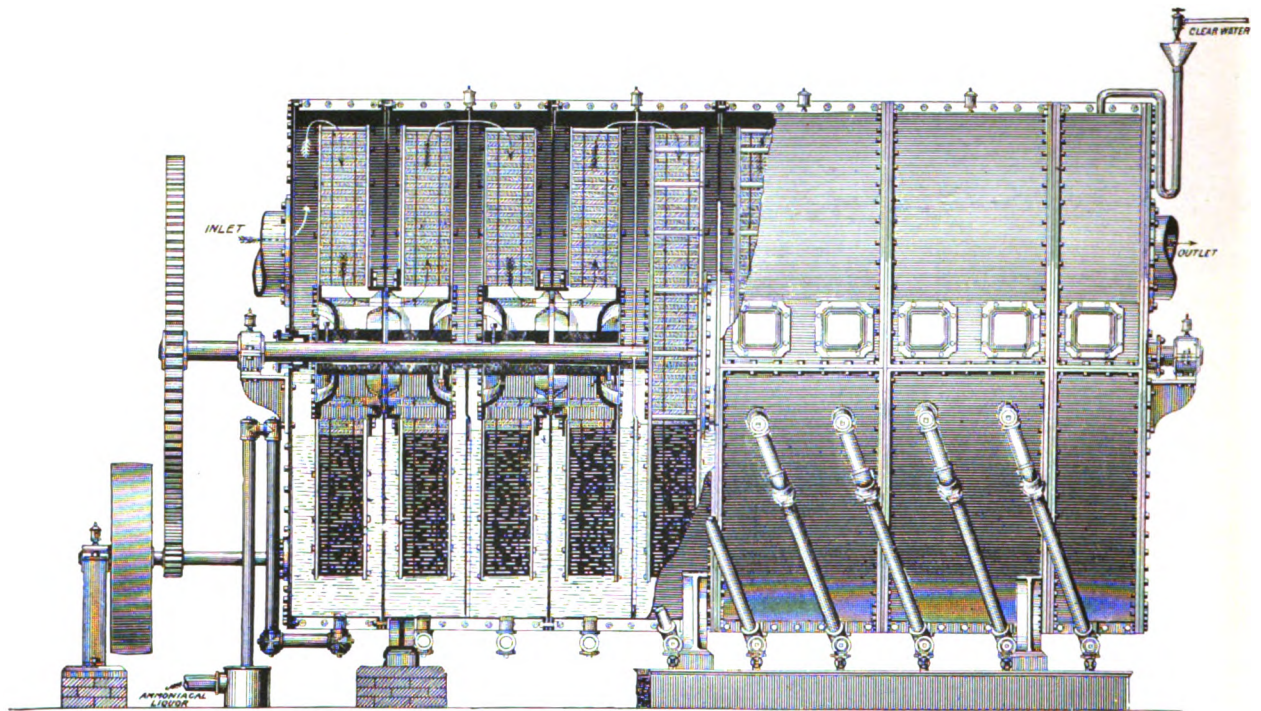
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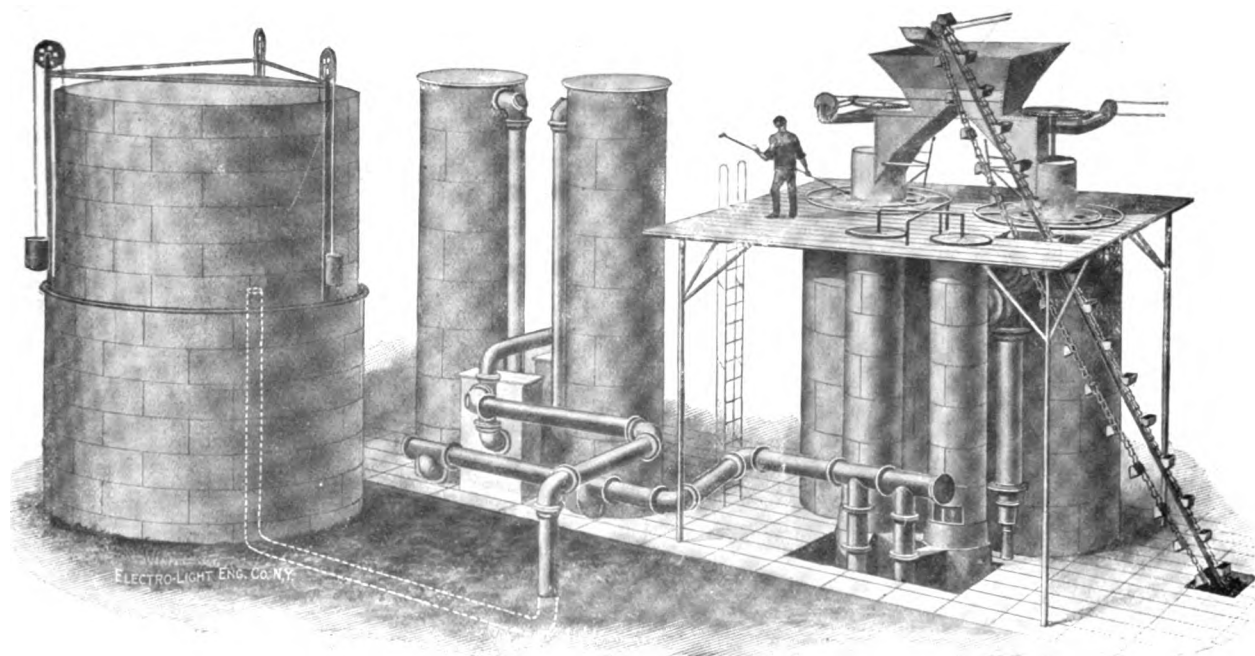
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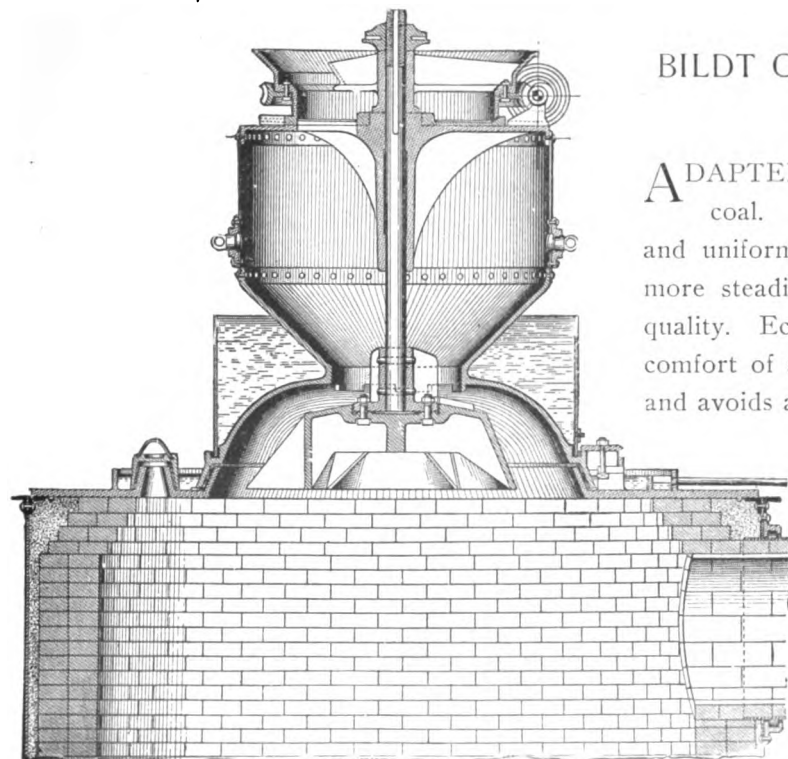


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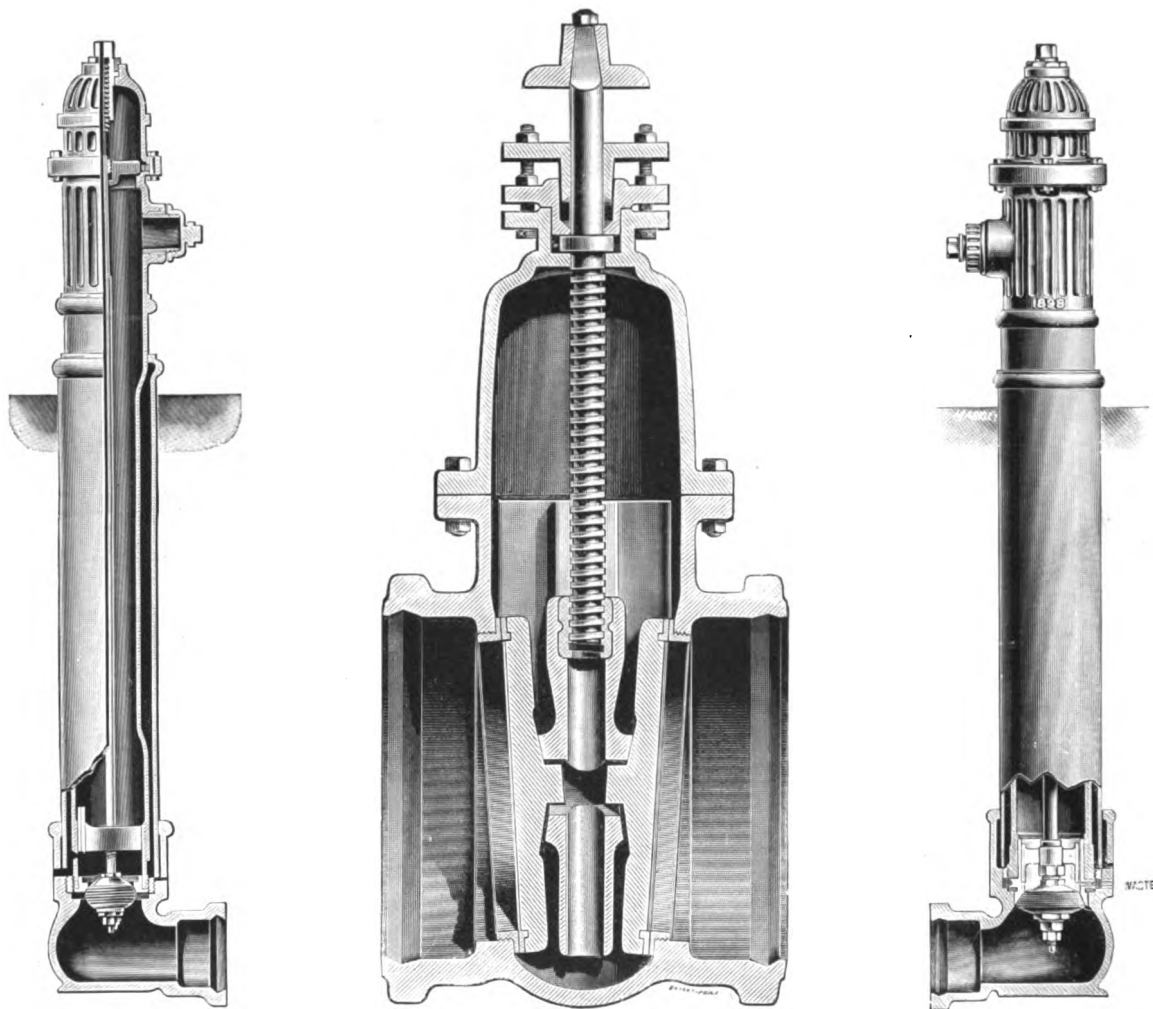
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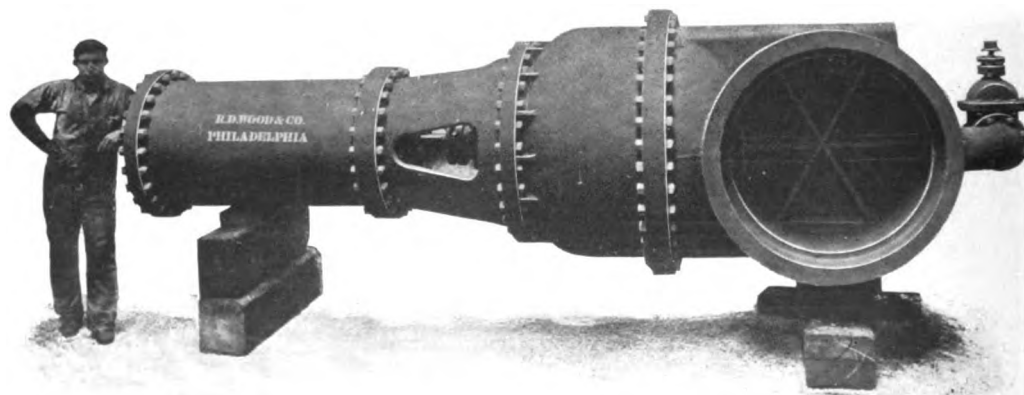
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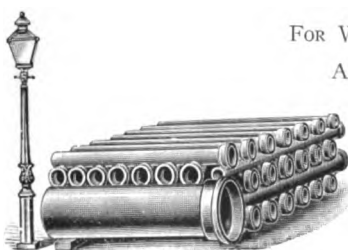
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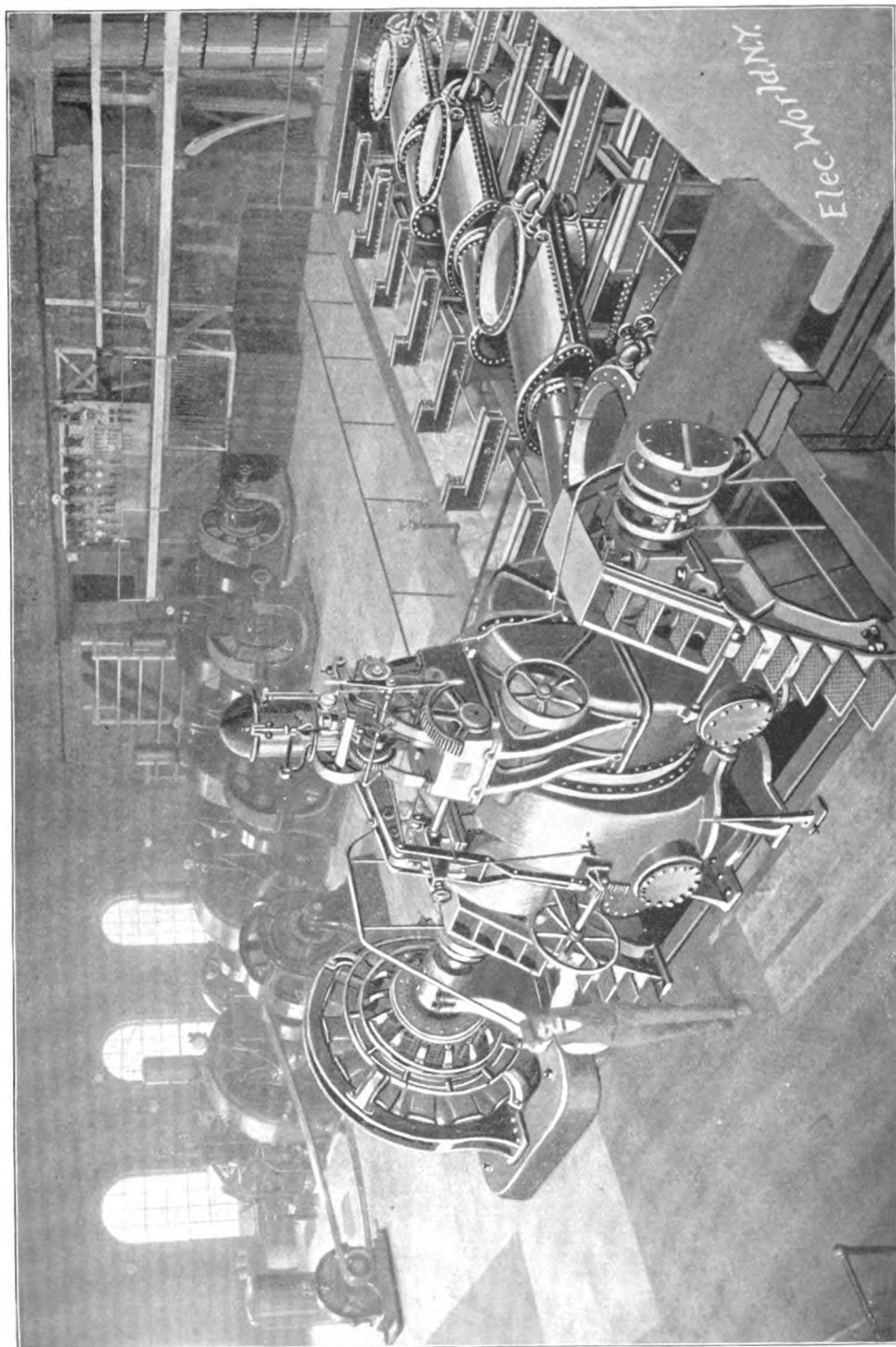
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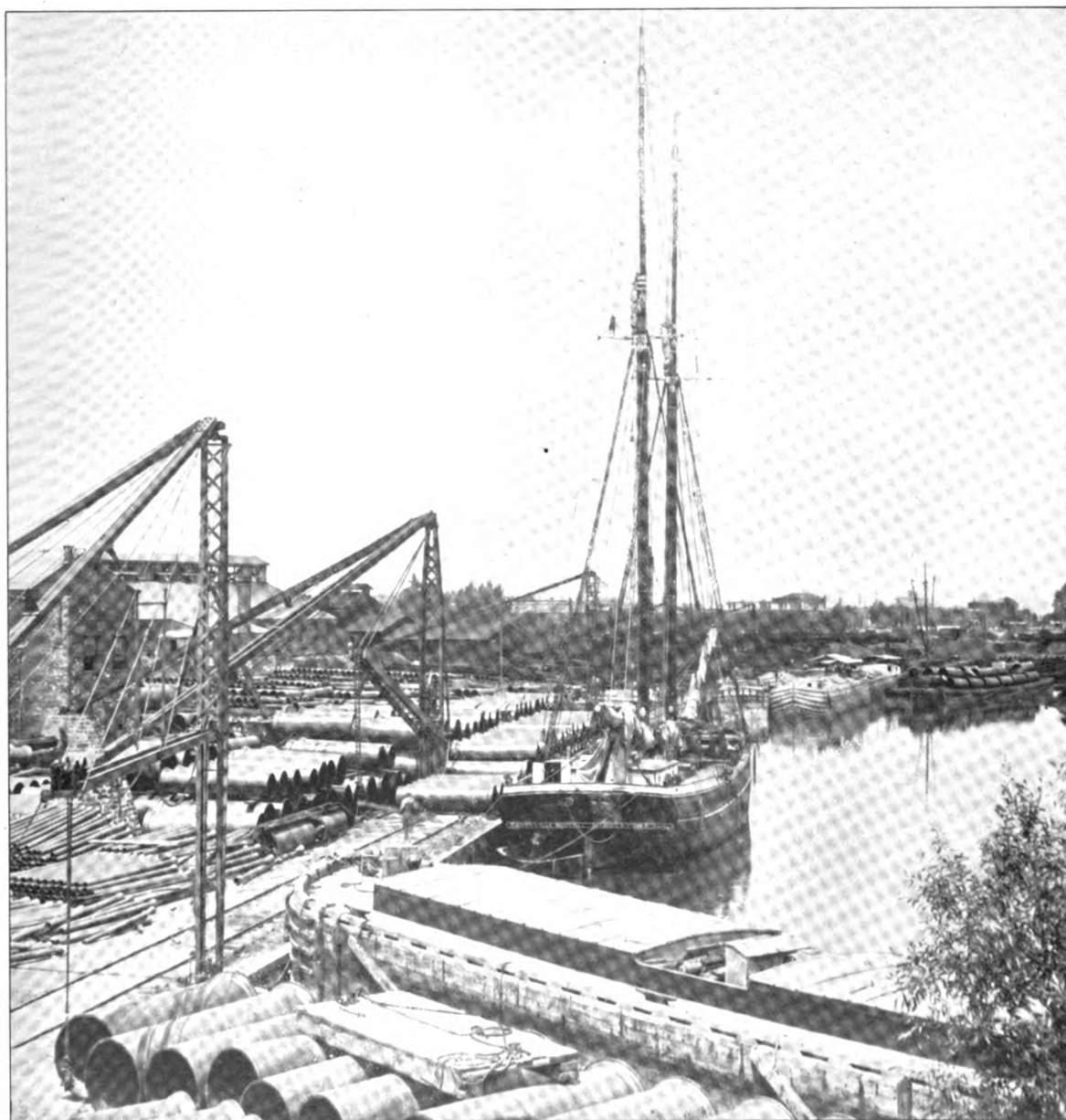
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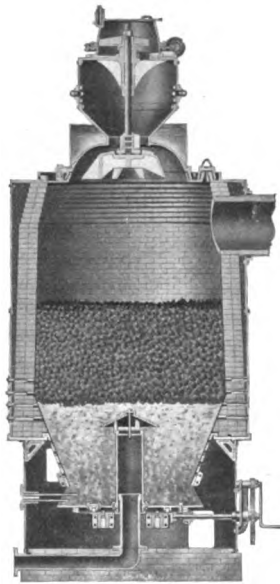


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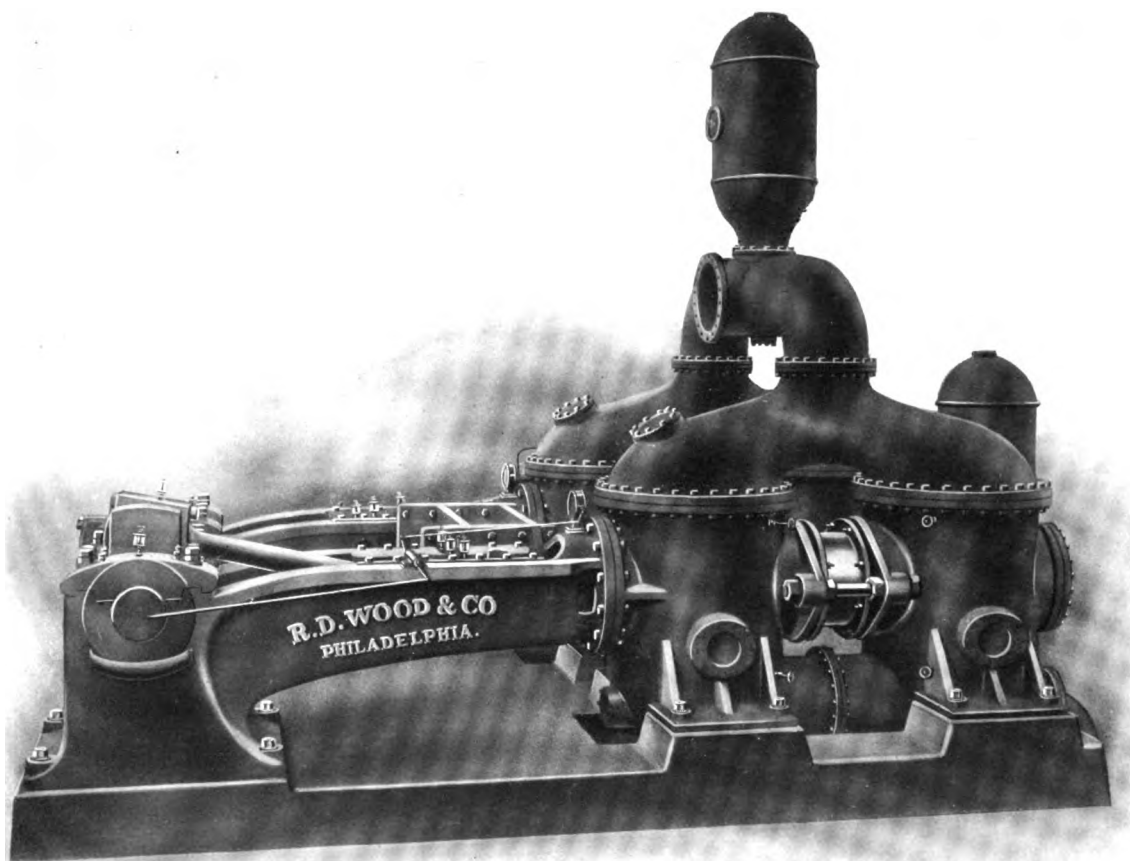
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